Review of Prospectus for Arbokem Inc. Flax Pulp Mill

Prepared by:
The Steering Committee of the
Major Project Review Process
February 1991

Ministry of Regional and Economic Development
Ministry of Environment

BC
S721
D. R41A
1991
c.4

91-04233/

Review of Prospectus for Arbokem Inc. Flax Pulp Mill

Prepared by:
The Steering Committee of the
Major Project Review Process
February 1991

Ministry of Regional and Economic Development
Ministry of Environment

Canadian Cataloguing in Publication Data

British Columbia. Steering Committee of the Major Project Review Process
Review of prospectus for Arbokem Inc. flax pulp mill

Co-published by: Ministry of Regional and Economic Development.
ISBN 0-7726-1282-X

1. Pulp mills - British Columbia - Surrey. 2. Flax industry - Environmental aspects - British Columbia - Surrey. 3. Arbokem Inc. I. British Columbia. Ministry of Environment. II. British Columbia. Ministry of Regional and Economic Development. III. Title.

TS1176.4.F42B74 1991 676'.14 C91-092090-7

EXECUTIVE SUMMARY

Project Description

Arbokem Inc.,through a wholly owned subsidiary, Canadian Flax Pulp Inc., is proposing to establish a flax pulp mill facility in Surrey, British Columbia which is effectively effluent-free. An innovative pulping technology is proposed to manufacture pulp from flax fibre instead of wood fibre, and to safely dispose of spent pulping liquor. The proposed plant has been designed to use 12,000 tonnes/year of flax fibre from Western Canada, and produce 7,000 air dried tonnes of bleached flax pulp and co-produce 13,000 tonnes of potassium-based liquid fertilizer annually for the export market. Target markets for the flax pulp and liquid fertilizer are primarily in East Asia and Western Europe. This flax pulp mill operation will also be used as a research facility and has the potential to test and demonstrate new pulping and bleaching methods for wood pulp mills in Canada and elsewhere.

Prospectus Review

Arbokem filed its Prospectus document with the Major Project Steering Committee (MPSC) on October 25, 1990. The Prospectus was distributed to federal, provincial, regional and municipal officials, and to public libraries in the municipalities of Vancouver, Surrey and Langley. The availability of the Prospectus in these libraries was advertised by the proponent in the Vancouver Sun, Vancouver Province and the Surrey Leader. In addition, organizations such as the West Coast Environmental Law Association, the Society Promoting Environmental Conservation, the Greenpeace Foundation of Canada, the Health Action Network and the Surrey-White Rock Environmental Coalition were each provided with a copy of the Prospectus for their review.

MPSC Decision

The MPSC endorses the concept of waste reduction, and the innovative technology embodied in this project. Arbokem's principal goal of constructing and operating a pulp mill without any adverse environmental impact is to be commended. Such measures are essential if industrial development in British Columbia is to be sustainable.

The MPSC's review of public and government agency comments has resulted in a decision to grant approval in principle to the Arbokem project, subject to the nine conditions outlined below. Approval in principle means that the impact management measures and spill and

operational contingency plans incorporated into the project design, should ensure that the Arbokem project is environmentally acceptable.

Conditions to Approval in Principle

The approval in principle decision is subject to the following nine conditions.

- The establishment of a Monitoring Committee to ensure that facility operations are technically feasible and environmentally sound over time. The Monitoring Committee will be responsible for overseeing the development of a program to monitor the potential impacts of the Arbokem project. The Monitoring Committee will be chaired by the Greater Vancouver Regional District (GVRD), and will include representatives from BC Environment, Environment Canada, the District of Surrey and Arbokem Inc.

- Air emissions to meet GVRD and MOE requirements;

- Discharged liquid effluent to meet municipal sanitary sewer use requirements;

- Prior to any change in operating procedures to utilize sodium sulphite in the pulping process, Arbokem will notify the Monitoring Committee and prepare a report describing reasons for its use and alternatives for the disposal of process wastes. The Monitoring Committee will review and advise regulatory agencies on such changes;

- Preparation of a spill contingency and emergency response plan, covering natural hazards, chemical spills and process upsets, etc., which is acceptable to B.C. Environment, the GVRD and the District of Surrey.

- Transportation of chemicals should meet Transport of Dangerous Goods requirements and any additional requirements the District of Surrey may have;

- Compliance with B.C. Fire Code regarding storage, handling and safety procedures at the facility;

- Standard industrial building conditions are to be met;

- Inspection of site to confirm that there are no significant archaeological resources.

These conditions address all major technical and operational concerns raised by government agencies and the public regarding the proposal. Conditions to approval in principle are described in further detail in Part Four of this report.

Before approval in principle could be formally granted, written assurance that these conditions would be met was required from the proponent. This written assurance has been received, and formal approval in principle has been granted to Arbokem Inc.

TABLE OF CONTENTS

1.0 THE MAJOR PROJECT REVIEW PROCESS

1.1 Overview of Major Project Review Process
1.2 Prospectus Preparation and Review
1.3 Review of Arbokem's Prospectus Document

2.0 PROJECT DESCRIPTION

2.1 Introduction
2.2 Process Description
2.3 Process Materials
2.4 Potential Impacts Associated With the Facility
2.5 Proposed Impact Management Measures

3.0 SUMMARY OF GOVERNMENT AGENCY AND PUBLIC COMMENTS

3.1 Government Agency Comments
3.2 Public Comments

4.0 MAJOR PROJECT STEERING COMMITTEE REVIEW AND DECISION

4.1 MPSC Decision
4.2 Conditions to Approval in Principle
4.3 Additional Recommendations

APPENDICES

Appendix 1 Arbokem Public Notice and Summary of Public Meetings
Appendix 2 Government Agency Comments
Appendix 3 Public Comments
Appendix 4 Arbokem Response to Government Agency Comments
Appendix 5 Arbokem Response to Public Comments
Appendix 6 Newspaper Articles on Arbokem Proposal
Appencix 7 MPSC Correspondence with Arbokem

PART ONE

THE MAJOR PROJECT REVIEW PROCESS

1.1 Overview of Major Project Review Process (MPRP)

The MPRP provides a comprehensive assessment of the environmental, social and economic impacts of major individual projects in British Columbia. Approval in principle is required prior to the issuance of all provincial permits, licenses or approvals for any project that falls under the jurisdiction of the MPRP (Appendix I, MPRP Guidelines).

The MPRP is administered by the Major Project Steering Committee (MPSC), comprised of senior government officials from the Ministry of Environment, Ministry of Regional and Economic Development, Ministry of Forests, Ministry of Municipal Affairs, Recreation and Culture, Ministry of Energy, Mines and Petroleum Resources, Environment Canada, and the Federal Environmental Assessment Review Office (FEARO). The Steering Committee is responsible for:

- determining if a proposed project needs to be subject to a comprehensive review under the MPRP;
- informing the proponent of the legislative and regulatory requirements that must be met;
- consolidating information requests and review comments;
- consulting with interested parties regarding the nature of the MPRP and opportunities for public involvement in the MPRP;
- procedural decisions with respect to the proposal; and
- recommendations on whether the proposal should be approved, rejected or reviewed further.

The MPRP is divided into three stages: Prospectus; Stage I; and Stage II. The number of review steps required for a project depends on the significance of anticipated policy, technical, social, economic, or environmental impacts. Once approval in principle is granted, the proponent finalizes the required permits and licenses with the appropriate government agencies.

Projects for which no significant impacts are anticipated, or for which identified impacts can be readily mitigated or managed, will normally be granted approval in principle at the conclusion of the Prospectus review. If the Steering Committee decides that a further review is required, then the project will be referred to either Stage I or Stage II.

1.2 Prospectus Preparation and Review

If the Steering Committee decides that a proposed project is subject to the MPRP, the proponent is required to prepare a Prospectus document(s) which:

- describes the project in detail;
- identifies potential environmental, social and economic impacts associated with the proposed project;
- identifies proposed impact management measures; and
- addresses the environmental, economic and social concerns and requirements raised by government agencies and the public participating in the review process.

Information requirements for the preparation of the Prospectus document are contained in Appendix 2 of the MPRP Guidelines. The level of detail of the document will vary with the complexity and nature of the project.

Other provincial and federal agencies and local and regional governments that may be affected by the proposed project are invited to participate in the evaluation of the proposal. Each government agency submits written comments to the Steering Committee with respect to:

- the thoroughness with which potential impacts associated with the project have been identified;
- the acceptability of proposed project plans and strategies to manage any identified impacts;
- the effect of the proposed project on the agency's mandate and jurisdictional responsibilities;
- a recommendation on approval, rejection or further review of the project.

The MPRP also provides the public with an opportunity to become involved in the review of the Prospectus document. Project proponents must ensure that local community, environmental and native groups are advised of proposed projects that affect them, and are given the opportunity to comment on such projects. In addition, the proponent is required to advertise and hold a public information meeting within two weeks of the distribution of its Prospectus document.

After the public and agency comments have been submitted, the Steering Committee prepares a report outlining its decision regarding disposition of the project. If the government is satisfied that the project is designed to accommodate all environmental, economic

and social concerns and interests, approval in principle will be granted. This enables the proponent to apply for the legal authorizations required to initiate development (Stage III). The report and an appendix of public and agency comments will be released to the public.

Terms and conditions to approval may be issued by the Steering Committee to reinforce permit conditions, address outstanding issues of concern, or to act alone in cases where no regulations or legislation exist to protect environmental resources, such as fish and wildlife habitat, for example. These conditions would address the major technical and operational concerns raised by government agencies and the public regarding the proposal. The purpose of attaching conditions to approval is to ensure that the construction and operation of the project is technically and environmentally sound. Before formal approval to begin construction of the project is granted, written assurance that these conditions will be met is required from the proponent.

1.3 Review of Arbokem's Prospectus Document

Arbokem formally submitted its Prospectus document to the MPSC for review under the MPRP on October 25, 1990. As a result of permitting responsibilities for the Arbokem project, the Greater Vancouver Regional District was represented on the Steering Committee for the project's review. Representatives from the District of Surrey were also invited to attend meetings of the Steering Committee to review submissions and decisions with respect to the disposition of the project.

The following federal, provincial, regional and municipal agencies were provided the opportunity to review and comment on the Prospectus document.

Environment Canada
Department of Fisheries and Oceans
Ministry of Energy, Mines and Petroleum Resources
Ministry of Environment
Ministry of Regional and Economic Development
Ministry of Agriculture and Fisheries
Ministry of Forests
Ministry of Native Affairs
Ministry of Tourism
Ministry of Parks
Ministry of Municipal Affairs, Recreation and Culture
Ministry of Government Management Services

Ministry of Transportation and Highways
Ministry of Education
Ministry of Social Services and Housing
Ministry of Advanced Education, Training and Technology
Ministry of Health
Ministry of Crown Lands
Greater Vancouver Regional District
District of Surrey
City of Langley
District of Langley
District of Pitt Meadows
City of Port Coquitlam
District of Coquitlam
City of New Westminster
District of Richmond
District of Delta
Fraser River Estuary Management Program

As part of the review of this project, the GVRD and District of Surrey staff visited Arbokem's research facility in Vancouver to inspect the flax pulping process, emissions and discharges and associated by-products.

On November 8, 1990 and December 1, 1990, Arbokem placed notices in: the Province, Vancouver Sun, and the Surrey Leader, inviting the public to attend a public information meeting about the project and inviting the public to submit written comments on the Prospectus to the MPSC. Copies of the Prospectus document were made available to the public for viewing at public libraries located in Surrey, Langley and Vancouver.

In addition to the copies of the Prospectus that were distributed to public libraries, the Prospectus document was sent to the following community and environmental groups for their review:

- West Coast Environmental Law Association
- Greenpeace Foundation of Canada
- Citizens for a Better Surrey
- Surrey-White Rock Environmental Coalition
- Fraser River Coalition
- Health Action Network Society
- Citizens Action Network
- United Fishermen and Allied Worker's Union
- Society Promoting Environmental Conservation.

PART TWO

PROJECT DESCRIPTION

2.1 Introduction

Arbokem Inc. of Vancouver is proposing to construct and operate a 20 air-dried metric tonnes/day bleached flax pulp mill in Surrey, British Columbia. Approximately 52 tonnes of liquid fertilizer will also be produced each operating day. It is anticipated that the mill will produce 7000 air-dried tonnes of bleached flax pulp and co-produce 13000 tonnes of potassium-based liquid fertilizer annually for the export market. Primary buyers of flax pulp would be paper mills located mainly in East Asia and Western Europe, which manufacture specialty thin papers, durable papers and high-quality writing papers. East Asia is the target market for the potassium-based liquid fertilizer. There are no other market flax pulp producers in North America.

Arbokem plans to locate its facility in the Port Kells Industrial Park, adjacent to the Fraser River. The land is zoned for industrial use and is already serviced with water, electricity, road access and fire protection. The proposed flax pulp mill is a permitted use on the 2.55 hectare site.

2.2 Process Description

The process line includes rotary digesters, pulp washers, beaters/refiners, screens/cleaners, a two-stage bleachery, pulp dryer, evaporator and activated sludge system for evaporator condensates.

Arbokem proposes to use its new patented process for producing pulp from flax straw and for disposing of spent pulping liquor. A potassium alkaline sulphite process will be used to produce the brown flax pulp. The alkaline/neutral sulphite pulp will be bleached to 80-points brightness using an oxygen-hydrogen peroxide process sequence. The spent pulping liquor as well as the bleaching effluent is to be collected and evaporated to a saleable liquid fertilizer product. All of the evaporator condensate and excess white water is to be treated biologically in a small activated sludge system. Ninety-five percent of the bio-treated effluent is to be recycled for use within the pulping and bleaching processes. The remaining 5% of the bio-treated effluent will be discharged into the municipal sanitary sewer.

In the event of potassium-base supply interruption and to diversify the market for concentrated pulp mill liquor, Arbokem states that a secondary use of the concentrated spent pulping liquor could be for road construction. A patented new road construction technology, known as "BC Stabilizer", requires lignosulphonate. The effluent produced in the flax pulping process can be used as the lignosulphonate component of the BC Stabilizer.

The B.C. Purchasing Commission recently awarded Arbokem Inc. the exclusive license to market the BC Stabilizer in Canada and abroad (except for USA). Arbokem will be the only company in British Columbia manufacturing the lignosulphonate component of BC Stabilizer, and has the sole rights to market BC Stabilizer technology for the provincial government.

The proposed flax pulp mill is unique in that:

- potassium salts are used instead of sodium salts in the alkaline/neutral sulphite pulping process. The spent pulping liquor as well as the bleaching effluent can therefore be collected and evaporated to a potassium-based liquid fertilizer product for the agricultural market. Fibrous materials rejected from pulp screens and cleaners will be collected and pulverized for blending with the liquid fertilizer;

- the alkaline/neutral sulphite pulp will be bleached using oxygen and hydrogen peroxide and not chlorine or chlorine dioxide. Thus, no dioxins or furan will be formed or discharged;

- the fibrous raw material to be used for pulp manufacture will be flax fibre, not wood fibre; and

- there is no landfilling or incineration required for waste by-products because the spent cooking liquor is to be used as fertilizer.

2.3 Process Materials

Approximately 12,000 tonnes of flax fibre per year will be procured from farmers/suppliers in Saskatchewan, Manitoba and British Columbia. The supply base of flax fibre in Western Canada is over 250,000 tonnes annually. Only 60,000 tonnes annually are committed to American pulp mills, the balance is largely burned in the fields. The flax pulp mill would require only about 5% of the available supply of flax straw in Canada.

Flax fibre will be decorticated, pressed and baled prior to shipment to the facility in 40-ft containers. These bales will be stored on-site in the warehouse.

Process chemicals used for flax pulping and bleaching will arrive at the facility in a pre-mixed form and stored on-site according to established safe industrial practices. The type and volumes of chemicals used in the process are documented in Arbokem's Prospectus.

2.4 Potential Impacts Associated With the Facility

Liquid Effluent

Process effluent amounting to about 80m^3/d and including evaporator condensates and excess white water is to be treated in an activated sludge treatment plant. Approximately 76 m^3/d of the biologically treated effluent is to be recycled back to the process and the remaining 4m^3/d will be sent to the municipal sanitary sewer system. The uncontaminated cooling water (44m^3/d) will likely be sent to the municipal storm sewer system. The gas-fired boiler blowdown will be collected into the liquid fertilizer stream, thereby eliminating any discharge of boiler cleaning chemicals.

The contaminants in the bio-treated effluent going to the municipal sewer system are stated to be minimal and are predicted to include less than 0.5 kg/d BOD, 2.5 kg/d COD and 1.0 kg/d TSS. Toxicity of the bio-treated effluent is to meet the 96h LC50 = 100% effluent concentration and pH should be at or near neutral. Because chlorine is not used in the bleaching process, there will be no AOX formed or discharged.

Air Emissions

Arbokem indicates that there will be very little discharge of free SO_2 associated with sulphite and kraft pulp mills or TRS compounds associated with kraft pulp mills. The total SO_2 emissions from the mill should be less than 2 kg/tonne of pulp at a scrubbing efficiency of 90 percent or better.

Since the power boiler is to use natural gas and the spent cooking liquor will not be incinerated, it is stated that there should be no particulate emissions or odoriferous gases from the mill. Carbon dioxide emissions from the flax pulp mill's power boiler are considered to be minimal at 18 tonnes per day.

Solid Waste

There will be an estimated 500 kg/d waste fibre from the flax pulping process. Arbokem proposes to pulverize this solid waste and blend it into the liquid fertilizer by-product. Therefore, no fibrous material or incinerator ash will be directed to landfill.

Fish and Wildlife Impacts

Wildlife impacts are considered negligible because the site is located within an established industrial park. No negative impacts on fish habitat are anticipated because there is to be no liquid effluent discharged directly to the environment. In addition, water intake will be drawn from the municipal water supply system and discharged to the existing municipal sanitary sewer system.

Aesthetic Impacts

There will be no visible boiler stack or water vapour plume. It is proposed that the gas-fired power boiler will have a low-profile stack, with a stack height of approximately 10 meters above ground level.

Archaeological Resource Impacts

No known archaeological resources of significance exist at the site. A study to verify this finding is to be commissioned by Arbokem.

Socio-economic Impacts

Arbokem's operations are not expected to result in any increase in overall noise level in the plant area. There will be no operation of high speed machines.

The proposed mill would employ 23 full-time workers, likely to be drawn from the Lower Mainland area.

The total increase in truck traffic is expected to have no measurable impact on the overall function of the Port Kells Industrial Park area. There is already a designated truck route from the Port Kells Industrial Park to Highway 401.

2.5 Proposed Impact Management Measures

The proponent has indicated in the Prospectus that the following measures will be employed to manage any potential impacts associated with the project.

- All of the evaporator condensate and excess white water is to be treated in a conventional biological treatment system, with 95% of the bio- treated effluent to be recycled for use in the pulping and bleaching operations. The remaining 5% of the treated effluent will be discharged to the municipal sanitary sewer system.

- Up to 2,000 tonnes of baled flax fibre is to be stored in a secure, fire-protected warehouse.

- Concentrated liquid fertilizer will be pumped directly into approved shipping containers (e.g. commercially available standard 20-ft. stainless steel-314 tank containers).

- High-efficiency gas scrubbers are to be installed to clean (building) exhaust vent gases, which would include accidental emissions of any digester vent gases that might escape when the digester cover is open, with dilute potassium sulphite/potassium hydroxide solution.

- Gas-fired boiler blow-down is to be collected into the liquid fertilizer stream, thereby eliminating any discharge of boiler cleaning liquids.

- Containment basins are to be constructed to surround each liquid and pulp storage tank, equalling 125% of the maximum tank volume.

- A spill basin is to be constructed to contain any emergency spills of untreated effluent. The volume of this basin (235m^3) will be equivalent to 200% of the daily effluent volume to be bio-treated.

- A batch process is proposed in which the operation will be started and shutdown twice each day. This means that in the event of a process upset, the entire operation can be easily shutdown.

- Arbokem is prepared to cease flax pulp production in the event there is no satisfactory market for the pulping/bleaching effluent.

PART THREE

SUMMARY OF GOVERNMENT AGENCY AND PUBLIC COMMENTS

A summary of comments submitted to the Steering Committee by government agencies and the public is provided below. Appendices 2 and 3 contain the detailed comments from government agencies and the public. Arbokem's responses to requests from government agencies and the public are presented in Appendices 4 and 5. Newspaper articles on the project proposal are found in Appendix 6.

3.1 Government Agency Comments

Environment Canada

Environment Canada has noted that the project will not likely have any significant environmental impacts. Environment Canada will be in a position to grant approval in principle once additional information on the following items is deemed to be acceptable:

- method of preparation and composition of cooking liquor and fertilizer by-product.
- anticipated emissions associated with digesting and evaporation.
- markets for the fertilizer by-product.

Environment Canada's concerns have been adequately addressed by Arbokem.

Department of Fisheries and Oceans

The Department of Fisheries and Oceans has stated that it would approve the project in principle if the following points are adequately addressed:

- a Contingency Plan must be provided for the site to include but not be limited to control of surface drainage, containment basins for chemical storage areas and for all process areas, and development of a spill response procedure;
- a monitoring program to ensure the cooling water is uncontaminated prior to its discharge to the storm sewer system must be instituted;

- the proposed site be characterized to include soil type, stability, permeability,and existing surface drainage patterns;

- the proponent must have a contingency plan in the event that the effluent will not be accepted to the GVRD sewer, either on a batch basis or on an ongoing basis;

- the proponent must have an acceptable alternate method of disposal for the fertilizer by-product, such as a letter from the Ministry of Transportation and Highways stating this product would be acceptable for their use, and indicating the volumes of the fertilizer that could be used; and

- during construction, measures must be taken to prevent silt-laden surface runoff from entering storm sewers, ditches, or other waterways.

In addition, the Department concurs that it is important for a Monitoring Committee to oversee all aspects of the construction and operation of the facility.

The Department of Fisheries and Ocean's concerns have been satisfied by Arbokem.

B.C. Environment

B.C. Environment has indicated that the proposal will not have any significant impacts on fish and wildlife resources or water courses. After reviewing the proposed project, B.C. Environment has determined that:

- there will be no requirement for a Waste Management Permit for the discharge of liquid effluent, since there is to be no direct discharge of pulp mill effluent to the receiving environment.

- a Waste Management Permit for air emissions will be required, but only for the emissions from the scrubbers, natural gas-fired boiler and water vapor from the pulp dryer. This will be administered by the GVRD.

- a Waste Management Permit for solid wastes will not be required as the proponent plans to pulverize the solid waste and blend it into the liquid fertilizer by-product.

It should be noted that project development will be subject to the standard industrial building conditions for siltation control and the installation of oil/grease interceptors in the storm water drainage system.

The following conditions should be met before approval in principle is granted:

- The municipality guarantee its acceptance of the bio-treated effluent ($4m^3$/day) and cooling water ($44m^3$/day) into its sanitary sewer system.
- The proponent provide a contingency plan in the event this effluent cannot be accepted into the municipal sanitary sewer system.
- The proponent provide a contingency plan for the disposal of the liquid fertilizer by-product in the event there is not a market for it.

These concerns have been satisfactorily addressed by Arbokem.

Greater Vancouver Regional District (GVRD)

The GVRD has no major concerns with the proposed project and has stated that most issues, particulary related to emissions, can be addressed during the permitting process. The GVRD will support approval in principle on the following conditions:

- to alleviate a concern with the disposal of the spent pulping liquor and other liquid wastes in case of market failure, the proponent is requested to provide an additional report describing alternatives for the utilization and/or disposal of the process wastes. While the solid waste produced could be handled by landfilling, the full volume of liquid wastes produced could not be handled by the proposed wastewater treatment system or by local disposal facilities.
- the proponent addresses whether the evaporator is a potential source of air emissions.
- the proponent provides adequate response to the comments raised by the GVRD.

In addition, it is suggested that the proponent consider using a natural gas-fired broiler that would meet or exceed the 1994 gas-fuelled boiler limit for NOx

emission of 30 ng/J of heat input, rather than the current national emission limit of 86 ng/J.

The GVRD's concerns have been satisfactorily addressed by Arbokem.

District of Surrey

The District of Surrey has indicated that the Arbokem proposal is a permitted use on the preferred site and does not present any major environmental concerns. The District has no objection to approval in principle being granted, provided that the project adheres to all relevant regulations. In addition:

- spill containment and contingency plan provisions must:
  - describe the extent to which sodium-based salts will be used in the manufacturing process and what volume of the sodium lignosulphonate waste will be generated and stored;
  - describe how the chemicals on-site are to be stored to ensure adequate pollution control and fire protection measures;
  - describe the characteristics of the waste liquid fertilizer product as well as details of the storage, handling and safety procedures that will be used.
- the proponent should review all fire suppression considerations with the local fire department.
- a permit for discharge to the municipal sanitary sewer will be required. The District of Surrey notes that the uncontaminated cooling water may not be accepted to the sanitary sewer due to the volume, but will likely be directed to the storm sewer. The cooling water must be analyzed to ensure there are no contaminants.
- potential noise and dust control at the site should be more fully addressed.

Further details on the construction and operation of the proposed facility will be required.

District of Surrey is satisfied that Arbokem has addressed their concerns.

Fraser River Estuary Management Program (FREMP)

FREMP has indicated to the MPSC that the proposed project does not fall within their jurisdiction. As a result, no comments were provided by FREMP with respect to the project.

Ministry of Agriculture and Fisheries

The Ministry of Agriculture and Fisheries has stated that the proposed project does not have a significant impact on their interests. Moreover, the Ministry has stated that the proposed use of residues as agricultural fertilizer is acceptable.

Ministry of Forests

The Ministry of Forests has stated that there are no concerns with the proposal as forest resources are not used in the production process.

Ministry of Regional and Economic Development

The Ministry of Regional and Economic Development has stated that no significant technical or socio-economic issues have emerged which cannot be addressed as a condition of project approval. The Ministry recommended that approval in principle be given to Arbokem's proposed flax pulp mill, subject to Arbokem identifying satisfactory means of disposing of any unsold potassium liquid fertilizer by-product and/or spent pulping liquor. The Ministry has noted that the proposed use of the spent pulping liquor for road stabilization purposes is only in the early stages of commercialization.

Arbokem has subsequently re-affirmed its commitment to seek buyers of its pulping/bleaching by-products and pointed out that the economic disposal of these by-products is essential to the marketing of its pulping technology. Arbokem's statement that it would cease production if the by-products could not be sold addresses the Ministry's concerns.

Ministry of Crown Lands

The Ministry of Crown Lands has stated that the proposed project is on private land and does not appear to impact any adjacent Crown lands.

Ministry of Education

The Ministry of Education has no comments on Arbokem's proposal.

Ministry of Social Services and Housing

The Ministry of Social Services and Housing has no objection to approval in principle being granted at the end of the Prospectus review. The Ministry requested that its clients have the opportunity to compete for available jobs and that the Ministry's area manager be contacted to discuss hiring procedures.

Ministry of Parks

The Ministry of Parks has no comments or concerns regarding the Prospectus.

Ministry of Native Affairs

The Ministry of Native Affairs has indicated that the project falls within the territory of the Musqueam Band. However, the federal government has not considered the area acceptable for negotiation as a comprehensive land claim. The Ministry has suggested that Arbokem consult with the Musqueam Band regarding the proposed project.

Ministry of Municipal Affairs, Recreation and Culture

a) The Development Services Branch has no objection to granting approval in principle to this project.

b) The Archaeology Branch recommends approval in principle for the project subject to Arbokem's commitment to conduct an archaeological site inspection prior to construction.

Ministry of Health

The Ministry of Health has no concerns with respect to the impact of the project on public health. The Surrey Medical Health Officer states that the operation is acceptable, based on the location and quantity of the output (20 t/d) and the types of chemicals used.

Ministry of Energy, Mines and Petroleum Resources

The Ministry of Energy, Mines and Petroleum Resources supports an approval in principle decision at this stage of the MPRP.

Ministry of Transportation and Highways

The Ministry of Transportation and Highways has no objection to approval in principle being granted for this project. The company has indicated that raw materials will be delivered by truck.

Arbokem has proposed that lignosulphonates, a by-product of the pulping process, can be used effectively as a dust suppressant. MOTH has approved the use of lignosulphonates for it's patented road stabilizer technology. Both MOTH and MOE have publicly announced that lignosulphonates passed provincial toxicity tests and are acceptable for use in British Columbia. In addition, the Ministry of Government Management Services (Purchasing Commission) has announced that Arbokem Inc. will have the exclusive license to market the MOTH patented road stabilization technology in Canada and abroad (except USA).

3.2 Summary of Public Comments

Public Information Meetings

Arbokem Inc. held two public meetings: one at the Surrey Inn on November 13, 1990 and one in Port Kells on December 4, 1990. Representatives of the Steering Committee were on hand to explain the MPRP to the community and interest groups, and outline the mechanisms for public consultation. Very few questions were raised about the potential impacts of the proposed project. Concerns about the water and air pollution aspects of the project were addressed by Arbokem at the meetings. Appendix 1 contains Arbokem's summary of the public information meetings.

Submissions on the Prospectus Document

Eleven submissions on the Arbokem Prospectus were received from the public. Concerns were raised about the uncertainty of new technology, impact on air and water resources, spill contingency plans and the disposal of fertilizer by-products. In addition, some of the public comments expressed concern about the short

time period (30 days) allocated for public review of the Prospectus document. Appendix 3 contains copies of the public submissions.

i) Uncertainty of New Technology

Several public comments mentioned that the technology was new to North America and therefore it was difficult to assess the potential environmental and social impacts. It was felt that the production process should be thoroughly investigated, and the potential environmental impacts of the proposed project be more fully assessed prior to construction and during process operation.

ii) Impact on Fish Habitat

Some concern was expressed about the possibility of liquid effluents being discharged to the Fraser River. The public has requested that measures to manage and control effluents and by-products from the facility be developed and closely monitored.

iii) Spill Contingency Plans

The respondents are concerned about the need for design contingencies to prevent, retain, recover and mitigate damage from, spills in a "worst case" scenario and under normal operating conditions.

iv) Marketability of Fertilizer By-Product

Concern was expressed that the waste by-products would be sold as fertilizer and not discharged to the Fraser River or the municipal sanitary sewer system.

The proponent has provided responses to the concerns of those individuals and groups who requested additional information or clarification of issues. Copies of these responses are contained in Appendix 5 and are deemed acceptable by the Steering Committee.

PART FOUR

MAJOR PROJECT STEERING COMMITTEE REVIEW AND DECISION

4.1 MPSC Decision

All submissions from the public and government agencies were carefully reviewed by the MPSC in January, 1991. The MPSC has determined that all identified issues could be addressed by either implementing the environmental protection measures proposed or by requiring the proponent to undertake additional protective measures. Therefore, Arbokem's proposed flax pulp mill has been granted approval in principle subject to the company agreeing to meet the following nine conditions.

4.2 Conditions to Approval in Principle

1. Monitoring Committee

A Monitoring Committee, chaired by the GVRD, will be established to oversee the development of a program to monitor potential impacts associated with plant construction and operations. The Monitoring Committee will include representatives from B.C. Environment, Environment Canada, the District of Surrey and Arbokem Inc. Detailed terms of reference are to be prepared by the Committee, and implemented by Arbokem Inc. The Committee will:

- develop a monitoring program that provides for the sampling and testing of air emissions, liquid effluent to be discharged to the municipal sewer system, and waste by-products. Air, water and waste streams will be monitored by Arbokem, and the Committee will be responsible for establishing testing protocol and for evaluating test results of the monitoring process;

- review and advise regulatory agencies about changes in process technology and the use and disposal of waste by-products; and

- report to the MPSC every six months.

The activities of, and need for, the Monitoring Committee will be reviewed by the MPSC two years after plant start-up.

Arbokem Inc. will be responsible for funding the monitoring program.

2. Air Quality

Arbokem will ensure that all air emissions from the facility meet the requirements of the GVRD. In addition, Arbokem must meet B.C. Environment's requirements for a waste management permit for air emissions from the scrubbers, natural gas-fired boiler and water vapor from the pulp dryer. The permit will be administered by the GVRD.

3. Effluent Treatment and Discharge

The discharged effluent will be required to meet municipal sanitary sewer use requirements. All evaporator condensates and excess white water must be treated in a secondary treatment system (activated sludge) prior to release into the municipal sewer system. In addition, the activated sludge and effluent discharge system must be designed to handle the maximum expected flow, including all excess white water as well as evaporator condensates. Used cooling water directed to the municipal storm sewer must be free of contaminants.

4. Utilization and Disposal of Spent Pulping Liquor

The project is based largely on the uniqueness of the patented potassium-sulphite pulping process. Spent pulping liquor and solid waste are to be sold as concentrated liquid fertilizer rather than incinerated or discharged to landfill or sewers. Alternatively, waste products may be sold as BC Road Stabilizer. Arbokem has indicated that sodium-sulphite would be suitable for use in the pulp mill in the event of an interruption in the supply of potassium-sulphite. Wastes from the sodium-based process are not suitable for sale as liquid fertilizer. However, sodium-based effluent can be used as the lignosulphonate component of the BC Road Stabilizer.

Prior to any change in operating procedures to utilize sodium sulphite, Arbokem will be required to prepare a report for the Monitoring Committee describing alternatives for the use and/or disposal of the sodium-based process wastes. The Monitoring Committee must be

assured that all regulatory requirements will be met and that there is a confirmed market for the sodium-based waste by-products, prior to commencement of production.

In the event there is no satisfactory market for the spent pulping liquor, Arbokem must confirm its commitment to cease flax pulp production.

5. Spill Contingency and Emergency Response Plan

Prior to startup, Arbokem will provide the Monitoring Committee with an Emergency Response Plan for potential spills of hazardous materials and for safeguards and procedures to be used during plant startup and upset conditions. A satisfactory program for training and testing of emergency response staff must be designed and implemented. In addition, Arbokem must prepare a Contingency Plan for the storage, handling and processing of process chemicals and associated waste by-products. The plan must provide assurance of adequate containment of spills to prevent discharge to the municipal sanitary sewer system or the Fraser River.

6. Transportation

The proponent must meet requirements of the Transport of Dangerous Goods Act and any additional transportation requirements the District of Surrey may have.

7. Fire Suppression Considerations

The proponent must meet with the District of Surrey Fire Department to review fire suppression considerations and to ensure compliance with the B.C. Fire Code regarding storage, handling and safety procedures at the facility.

8. Industrial Building Conditions

The proponent must met the standard industrial building conditions for siltation control and the installation of oil/grease interceptors in the storm water drainage system.

9. Archaeological Site Inspection

Arbokem is required to provide the Archaeology Branch of the Ministry of Municipal Affairs, Recreation and Culture with the results of an archaeological site inspection prior to construction activity to confirm that there are no significant impacts on archaeological resources.

These nine conditions are in addition to any commitments made by Arbokem in the Prospectus document, and outlined in Section 2.5. As a result of receiving approval in principle from the MPSC, Arbokem may now finalize permitting and licensing of its project with the appropriate government agencies. Where necessary, these conditions will be written into Arbokem's permits.

4.3 Additional Recommendations

The MPSC recommends that Arbokem should address the following issues, which are <u>not</u> conditions of the approval in principle decision.

- Arbokem should contact B.C. Hydro and BC Gas to confirm their view that the existing utility infrastructure at the site is adequate to meet the needs of the proposed mill and to discuss the incorporation of energy efficient design features in the plant design.

- Arbokem should consider using a natural gas-fired boiler that would meet or exceed the 1994 gas-fuelled boiler limit for NOx emission of 30 ng/J of heat input, rather than the current national emission limit of 86 ng/J.

APPENDICES

APPENDIX 1

Arbokem Public Notice and Summary of Public Meetings

The Vancouver Sun, Thursday, November 8, 1990 ★★★★★

PUBLIC INFORMATION MEETING

ARBOKEM INC.

PROPOSED FLAX PULP MILL

SURREY, B.C.

A public meeting will be held at the Surrey Inn (9850 King George Highway, Surrey) on Tuesday, November 13, 1990 at 7 PM, to outline Arbokem's proposal to develop a 20 tonnes per day flax pulp mill at Port Kells Industrial Park in Surrey, B.C. Flax pulp is used in the manufacture of high grade paper, such as that used for currency. Arbokem's proposed project is subject to review under the Major Review Process (MPRP).

Representatives of the Company will provide interested parties with general information on the Project. A representative of the Major Project Steering Committee will also be on hand to explain MPRP, and how the public can participate in the review process.

A Prospectus document, which describes the Project and its potential impacts, has been released for public review. The Prospectus is available for review at all Surrey and Langley branch libraries, the Vancouver Public Library and the Surrey Office of the Ministry of Environment (10034-152A St.). Members of the public wishing to submit written comments on Arbokem's Prospectus are asked to do so by December 7, 1990.

Please forward your written comments to:

Mr. David Parson
MPRP Coordinator
Environment Assessment Branch
BC Environment
777 Broughton St.
Victoria, B.C.
V8V 1X5
Tel: 387-9674
FAX: 356-7183

Mr. Alfred Wong
President
Arbokem Inc.
Suite 101
358 East Kent Avenue South
Vancouver, B.C.
V5X 4W6
Tel: 321-9331
FAX: 321-3043

FINAL PUBLIC INFORMATION MEETING

ARBOKEM INC. PROPOSED FLAX PULP MILL SURREY, B.C.

A second public meeting will be held at the cafeteria of Kockums Cancar Inc. (19433 96th Avenue, Surrey) on Tuesday, December 4, 1990 at 7 P.M., to outline Arbokem's proposal to develop a 20 tonnes per day flax pulp mill at Port Kells Industrial Park in Surrey, B.C. Flax pulp is used in the manufacture of high grade paper, such as that used for currency. Arbokem's proposed project is subject to review under the Major Project Review Process (MPRP).

Representatives of the Company will provide interested parties with general information on the Project. A representative of the Major Project Steering Committee will also be on hand to explain MPRP, and how the public can participate in the review process.

A Propectus document, which describes the Project and its potential impacts, has been released for public review. The Prospectus is available for review at all Surrey and Langley branch libraries, the Vancouver Public Library and the Surrey Office of the Ministry of Environment (10034-152A St.). Members of the public wishing to submit written comments on Arbokem's Prospectus are asked to do so by December 7, 1990.

Please forward your written comments to:

Mr. David Parson
MPRP Coordinator
Environment Assessment Branch
B.C. Environment
777 Broughton St.
Victoria, B.C.
V8V 1X5
Tel: 387-9674
FAX: 356-7183

Mr. Alfred Wong
President
Arbokem Inc.
Suite 101
358 East Kent Avenue South
Vancouver, B.C.
V5X 4W6
Tel: 321-9331
FAX: 321-3043

ARBOKEM INC.
Suite 101, 358 East Kent Ave. South, Vancouver, B.C. V5X 4W6 Canada
Tel.: (604) 321-9331 Fax: (604) 321-3043

To: David Parsons/ MPRP Steering Committee AK7226
Victoria

From: Al Wong/ Vancouver

Date: January 2,1990

Re: Proposed Flax Pulp Mill/ Public Meetings

As per your request, I have prepared a summary of the Public Information Meetings held for the our proposed flax pulp mill project.

Meeting No. 1, Surrey Inn, November 13, 1990

The estimated attendance for this Meeting was 65. On the basis of the type of post-presentation questions from the attendees, we have concluded that the at least 90% of the attendees were regional suppliers or goods and services (including two Saskatchewan farmers who live in Surrey during the winter months). The total length of the Meeting was about 2-1/2 hours.

There were a few questions regarding the water and air pollution aspects of the proposed flax pulp mill. We suspect that at least one resident of Walnut Grove (at the North Langley border) is concerned about the potential "kraft" odour problem. Our replies were:

Air pollution....The proposed flax pulp mill is not a kraft wood pulp mill. The chemistry fundamentals are different.

The principal source of odoriferous air emission in kraft mills is from the burning of spent pulping liquor. No burning of the spent liquor from the proposed flax pulp mill is planned. The spent pulping liquor would be collected and concentrated into a liquid product for the fertilizer and road stabilization markets.

Water Pollution..The proposed flax pulp mill is not a kraft wood pulp mill. Flax pulp bleaching is less intense. A pulp brightness level of only 80% is needed. No chlorine or chlorine dioxide will be used in bleaching. All bleaching effluent will be collected for conversion to fertilizer/road stabilization products.

Condensate from the evaporation of combined pulping and bleaching effluents will be bio-treated principally for the purpose of improving reuse of process water.

For process control reasons, a small volume of the bio-treated condensate (about 4 m^3/day) is planned for discharged to the GVRD sewer system. The BOD loading of this effluent discharge is estimated to be less than 1 kg/day. There will be no dioxins, no furans and no chlorinated organics in this effluent stream.

Technology.....Arbokem is in the technology development business. We are interested to market the novel process technology to others outside of British Columbia.

Therefore, it is most important for us to demonstrate that this Arbokem-invented technology flax pulp mill can be built and operated successfully in an urban setting with virtually no adverse impact on the present environment.

Copies of relevant technical papers on flax pulping and bleaching were available for inspection at the Meeting. We also had displays of samples of principal process chemicals to be used, flax pulp and paper samples, and conversion of flax straw to flax fibre in Saskatchewan. The attendees were invited to write in their immediate comments into the "Comments" book at the Meeting. Copies of the three comments received are attached for your perusal.

Meeting No. 2, Port Kells, December 4, 1990

The estimated attendance at this Meeting was 16. Only 4 persons were not suppliers or government officials. Of the 4 people,two persons were news reporters and two persons were believed to be "local area" residents.

There were very few questions raised about the impact on the immediate (Port Kells) air and water environment. Our replies were essentially the same as those given in Meeting No. 1. There was one written request for a copy of the Prospectus.

In summary, no vocal opposition to the proposed flax pulp mill project has emerged during both Public Information Meetings. We trust that your Committee has also the same overall impression.

Regards

APPENDIX 2

Government Agency Comments

Environment Canada
Conservation and Protection
224 West Esplanade, 5th Floor
North Vancouver, B.C. V7M 3H7

003917

December 20, 1990

Your File: 65.425
Our File: 4202-1

Mr. David Parsons
MPRP Coordinator
Environmental Assessment Branch
B.C. Environment
777 Broughton Street
Victoria, B.C.
V8V 1X5

BRITISH COLUMBIA
ENVIRONMENT
JAN 02 1991
INTEGRATED RESOURCE MANAGEMENT

Dear Mr. Parsons:

Re: Arbokem Inc. - Flax Pulp Mill Prospectus Reviev

Reference is made to your referral dated November 7, 1990 on the above subject.

Environment Canada staff have revieved the prospectus and feel that there is not enough information presented to do a proper technical reviev. The prospectus has very little information on the actual process and equipment that will be used. This proposal is a very small scale mill, and will not likely have significant environmental impact. In particular, ve vould like to see more information on the following items:

1. Process chemistry - method of preparation and composition of cooking liquor and fertiliser byproduct.

2. Details of expected emissions associated with digesting and evaporation.

3. Markets for the fertiliser byproduct.

Subject to this information being acceptable, ve feel that approval in principle could be given, and any remaining concerns could be addressed in the permitting phase. Accordingly, ve recommend that you take immediate steps to have the proponent supply the requested information. Upon receipt of this information, and its being found acceptable, ve will be in a position to recommend approval in principle.

Yours truly,

Colin I. Steward
for

A.C. Duncan, P.Eng.
Coordinator
Referral and Liaison

Fisheries and Oceans
Pêches et Océans
610 Derwent Way
Annacis Island
New Westminster, B.C.
V3M 5P8

0004437 65.425

Your file / Votre référence 8900-7

Our file / Notre référence

February 1, 1991

BRITISH COLUMBIA
ENVIRONMENT
FEB 05 1991
ENVIRONMENTAL IMPACT
ASSESSMENT BRANCH
VICTORIA, B.C.

David Parsons
MPRP Coordinator
Environmental Assessment Branch
Ministry of Environment
777 Broughton Street
Victoria, B.C. V8V 1X5

Dear Mr. Parsons:

RE: ARBOKEM INC. - FLAX PULP MILL PROSPECTUS REVIEW

The above prospectus has been received in this office on January 25, 1990, for review and comment.

Please be advised that pursuant to the Environmental Assessment and Review Process (EARP) Guidelines Order (1984), the Department of Fisheries and Oceans will be conducting an EARP screening of this proposal. It is anticipated that the EARP screening will be conducted in conjunction with the Major Project Review Process (MPRP) and will be completed at the end of Stage II of the MPRP.

Currently, the Department of Fisheries and Oceans has reviewed this prospectus and the 'Review of Prospectus' provided by the MPRP. For the purposes of completing Stage I of the MPRP, we approve the project in principle as described. However, the following points must be addressed before we can complete the EARP screening and give final approval for the project to proceed:

1. A Contingency Plan must be provided for the site, to include but not be limited to: control of surface drainage, containment basins for chemical storage areas and for all process areas, development of a spill response procedure;

2. A monitoring program to ensure the cooling water is uncontaminated prior to its discharge to the storm sewer system must be instituted;

3. The proposed site be characterized to include soil type, stability, permeability, existing surface drainage patterns;

4. The proponent must have a contingency plan in the event that the effluent will not be accepted to the GVRD sewer, either on a batch basis or on an ongoing basis;

5. The proponent must have an acceptable alternate method of disposal for the fertilizer by-product, such as a letter from the Ministry of Transportation and Highways stating this product would be acceptable for their use, and indicating the volumes of the fertilizer that could be used;

6. During construction measures must be taken to prevent silt-laden surface runoff from entering storm sewers, ditches, or other waterways.

Should the above items be addressed to our satisfaction, we would have no objection to this proposal.

As Waste Management Branch Permits will not be required for discharges into the sanitary sewer, we concur that it is most important for the Monitoring Committee to oversee all aspects of the construction and operation of the facility.

Please address any further correspondence to myself or Karen Hutton (666-6479) at this office.

Yours truly,

for

C.D. Paterson, Head
Habitat Management Unit
Fraser R., N.B.C. & Yukon Division

cc B. Sherwood, EC
D. McIlroy, EC
S. Samis, DFO

Fisheries and Oceans
Pêches et Océans
610 Derwent Way
Annacis Island
New Westminster, B.C.
V3M 5P8

Your file Votre référence
65.425
Our file Notre référence
8900-7

February 7, 1991

David Parsons
MPRP Coordinator
Environmental Assessment Branch
BC Environment
777 Broughton Street
Victoria, B.C. V8V 1X5

Dear Mr. Parsons:

RE: ARBOKEM INC. - FLAX PULP MILL CONDITIONS OF APPROVAL

The Draft conditions for the MPRP approval-in-principal of the Arbokem proposal, received by fax on February 7, 1991, have been reviewed.

The concerns identified in our February 1, 1991 letter, (Paterson to Parsons) have been addressed to our satisfaction. We do not object to the granting of approval-in-principal subject to the nine conditions identified in the draft letter to Mr. Wong.

It is anticipated that the Department of Fisheries and Oceans decision report to the EARP Screening process will be completed pending receipt of the companys' written assurance that the nine points will be met.

If you have any questions, please contact myself or Karen Hutton (666-6479) at this office.

Yours truly,

C.D. Paterson, Head
Habitat Management Unit
Fraser R., N.B.C. & Yukon Division

/KH

004598

BRITISH COLUMBIA
ENVIRONMENT
FEB 14 1991
POLICY & PLANNING
VICTORIA, B.C

Canada

Province of British Columbia
WASTE MANAGEMENT BRANCH

Ministry of Environment

0035?

MEMORANDUM

ENVIRONMENT

DEC 07 1990

December 6, 1990
File: 43350-07

To: D. Parsons
MPRP Coordinator
Environmental Assessment Branch

Re: Arbokem Inc. Flax Pulp Mill Prospectus Review

Further to your request for my review of the Prospectus document for the Arbokem Inc. flax pulp mill as part of the MPRP the following are my comments, particularly with reference to Section 4:

A. Liquid Effluent

- Process effluent amounting to about 80 m^3/d and including bleach plant effluent, evaporator condensates and excess white water is to be treated in an activated sludge treatment plant. Approximately 76 m^3/d of the biologically treated effluent is to be recycled back to the process and the remaining 4 m^3/d along with 44 m^3/d uncontaminated cooling water is to be sent to the municipal sewer system.

- The contaminants in the bio-treated effluent going to the municipal sewer system are stated to be minimal and include less than 0.5 kg/d BOD, 2.5 kg/d COD, 1.0 kg/d TSS and the toxicity is to meet the 96h LC50 = 100% effluent concentration and pH should be at or near neutral. There will also be no AOX discharged.

- Containment basins for possible spills from liquid and pulp storage tanks are to be provided along with a spill basin to contain any emergency spills of untreated effluent. The volume of the spill basin is to be 235 m^3 which represents approximately 3 days retention of untreated mill effluent. Contents of the spill basin would presumably be bled into the activated sludge system. This should be checked with the proponent.

- Since there is to be no direct discharge of pulp mill effluent to the receiving environment there will be no requirement for a Waste Management Permit for the discharge of liquid effluent.

B. Air Emissions

- It is proposed there will be no discharge of free SO_2 associated with sulphite and kraft pulp mills or TRS compounds associated with kraft pulp mills.

- The spent cooking liquor would be used as liquid fertilizer and not incinerated. In addition, the power boiler is to use natural gas. Therefore, there should be no particulate emissions from this mill.

- Scrubbers are to clean building exhaust vent gases which would include accidental emissions of digester vent gases that escape when the digester cover is opened with dilute K_2SO_3/KOH solution.

- A Waste Management Permit for air emissions will be required, but only for the emissions from the scrubbers, natural gas fired boiler and water vapour from the pulp dryer.

C. Solid Waste

- There will be an estimated 500 kg/d waste fibre from the process. The proponent proposes to pulverize this solid waste and blend it into the liquid fertilizer by-product.

- A Waste Management Permit for solid wastes will not be required.

In summary, this proposed flax pulp mill should be acceptable from a Waste Management point of view in that the only discharges to the environment would be minimal amounts of CO_2 and water vapour emissions with no liquid effluent or solid waste discharge.

Before approval is granted for this operation, the municipality should guarantee its acceptance of the bio-treated effluent (4 m^3/d) and cooling water (44 m^3/d) into its sewer system. The proponent should also provide a contingency plan in the event this effluent, for whatever reason, cannot be accepted into the municipal sewer system. A contingency plan is also required for the disposal of the liquid fertilizer by-product in the event there is no market for it.

D.Y. Morrison

D.Y. Morrison, P.Eng.
A/Head, Technical Services

cc: K. Hicke

DYM/mb

Province of
British Columbia

BC Environment

Lower Mainland Region
10334 — 152A Street
Surrey
British Columbia
V3R 7P8
Telephone: (604) 584-8822
Facsimile: (604) 660-8926

December 18, 1990

BRITISH COLUMBIA
ENVIRONMENT
DEC 28 1990
ENVIRONMENTAL IMPACT
ASSESSMENT BRANCH
VICTORIA, B.C.

Mr. David Parsons, MPRP Coordinator
Ms. Sharon Daly, Project Coordinator
Environmental Assessment Branch
B. C. Environment
777 Broughton Street
Victoria, British Columbia
V8V 1X5

003906

Dear Sir/Madam:

Re: Arbokem Inc. Flax Pulp Mill Prospectus Review

This memo is in response to your requests of November 11 & 16, 1990, requesting regional input to the Arbokem Inc. Prospectus review.

On the basis of the Prospectus, this proposal will not have any significant environmental impact. There are no fish or wildlife habitats affected, no water courses involved and all liquid effluents will be passed through the municipal sewage system. Air effluents are minimal and the responsibility of the GVRD.

The development will be subject to the standard industrial building conditions:

- siltation control
- oil/grease separators installed in the storm water drainage system

As this process is new, we look forward to receiving any information from Dave Morrison's review that will assist in future assessments of these mills.

Sincerely,

Brian J. Clark, RPBio
Environmental Coordinator

BJC:rf

cc: J. W. McCracken
B. Dabrowski
M. Gow

Recycled Paper

British Columbia Handle with care

MEMORANDUM

TO: Barrie Mills

DATE: December 20, 1990

FROM: Cristina Jacob

FILE: 17.00.00

RE: ARBOKEM INC. PROSPECTUS

On November 7, 1990, Arbokem Inc. submitted a Prospectus document to the Major Project Review Process Steering Committee. Deadline for receiving government agencies comments by the Steering Committee is December 21, 1990. Public review deadline was December 7, 1990. Based on public and government agency comments, the Steering Committee will decide whether or not to award Arbokem the approval-in-principle at the Prospectus stage of the review process.

I have coordinated the reviewing of Arbokem's Prospectus by staff of the Air Quality and Source Control Department and Solid Waste Division of the GVRD. Attached are Francis Yuen's and Toivo Allas' memoranda containing their review and comments on the 7000 air dry tonnes/year of bleached flax pulp mill proposed by Arbokem.

In summarizing their review, I would like to point out that there were no major concerns with the proposed process to produce flax pulp and that most of the issues will be dealt with during the permitting process. However, it must be noted that there is a major concern with disposal of the spent pulping liquor and other liquid wastes in case the marketing arrangements for the liquid fertilizer fail. Each production day the process will produce 20 air dry tonnes of flax pulp and "co-produce" 52 tonnes of liquid fertilizer at 50% solids.

Producing the liquid fertilizer is Arbokem's means of dealing with disposal of the spent pulping liquor, bleaching effluent and solid residues from pulp screening and refining. The proposal lacks fexibility in dealing with the process wastes as it is based on the assumption of a secure market for the liquid fertilizer. While, in case of no market for the liquid fertilizer, the solid waste produced may be handled by landfilling, the liquid waste that the process will produce cannot be handled by the proposed wastewater treatment system or by the local disposal facilities.

I recommend that the District supports that Arbokem be given the approval-in-principle at the Prospectus stage of the Major Project Review Process only if the issues of disposing of the process wastes are addressed in their complexity.

CJ/143

MEMORANDUM

TO: Cristina Jacob

DATE: December 11, 1990

FROM: Francis Yuen

FILE: 17.00.00

RE: Review of Canadian Flax Pulp Mill Prospectus

SUMMARY
As per your request, I have reviewed the Prospectus and pertaining information provided to us by Mr. Alfred Wong of Arbokem Inc. with respect to the potential air emissions and effluent discharge from the proposed new flax pulp mill in Surrey. Based on the available information, I see no reason not to allow the proposed effluent discharge to the GVRD sewer provided that Arbokem meets all the requirements to be specified during the permitting stage.

At present, Arbokem is unable to provide details of the potential air emissions from the mill. There appears to be no major problems with their proposed emissions. Arbokem should be able to select a wet scrubber system and a proper process design for the proposed mill to meet the GVRD air permit limits for sulphur dioxide, particular matter, odour and opacity. The mill will have to carry out emission monitoring as required by the permit.

BACKGROUND
Arbokem proposes to build a small (20 tpd) flax pulp mill at Port Kells Industrial Park in Surrey. The company plans to use their patented technology using potassium salts for pulping. According to the inventor, this new potassium-based technology provides a means of disposal of spent pulping liquor and offers an economical and environmentally-safe way to manufacture flax pulp.

In contrast, most flax pulp mills simply discharge the untreated spent pulping liquor into the receiving waters, or operate recovery systems to burn the spent pulping liquor. When these mills are subject to more stringent pollution control laws, many of them will have to shut down or modernize their process.

The air pollutants and effluent generated from sulphite pulp mills are quite different from kraft or mechanical pulp mills. Even within the sulphite industry itself, emissions and effluent discharges vary because of differences in cooking liquor makeup, pH and recovery methods. The proposed pulp mill uses an alkaline/neutral (pH= 9-12) sulphite pulping process with no incineration or discharge of the spent pulping liquor.

POTENTIAL AIR EMISSIONS
In general, sulphite mills do not experience the odour problems of a kraft mill. Since there is no sulphite liquor burning in recovery boilers, H_2S and particulate matter will not be emitted. Organic reduced sulphur (TRS) compounds are not produced.

Most sulphite pulp mills operate with acidic SO_2 solutions and, therefore, SO_2 is the main gaseous air pollutant. However, the potential for release of SO_2

OTHER RELATED ISSUES

All sulphite process spent liquors can be burned if evaporated to 55% dry solids. Arbokem should clarify the flammability of the liquid fertilizer. According to the findings, the maximium storage capacity for fertilizer at the mill may be restricted.

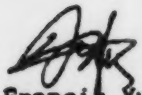
Should the demand for the liquid fertilizer fall, Arbokem should have an alternative method to dispose of the spent liquor and bleaching effluent. A report of this option should be submitted and approved by the relevant regulatory agencies.

For other mills, spills and unnecessary sewer losses account for as much as 1/3 of the pollutants discharged. Arbokem should design the mill to minimize spills along with collecting and reprocessing of materials. By stabilizing the operation process and optimizing its operating capacity, the frequency and the extent of spills can be reduced.

REFERENCES

Listed below are the references used for this memorandum:

- -Environmental Pollution Control Pulp and Paper Industry, Part 1: Air;
- -Canadian Flax Pulp Mill Prospectus and Process Flow Diagram;
- -Toxicity of Effluents from Sulphite Pulping Operations Practicing Recovery and Biological Treatment;
- -Air Pollution Emissions and Control Technology: Wood Pulping Industry;
- -B.C. Pollution Control Objectives for the Forest Products Industry;
- -Management Plan for NOx and VOCs;
- -Port Alice Mill Pulp Air and Effluent Permits;
- -Pulp and Paper Chemistry and Chemical Technology, Volume 1 & 2;
- -Potassium Based Pulping of Wheat Straw;
- -A Novel Sulphite Pulping and Chemical Recovery System for Small and Medium Scale Pulp Mills;
- -Wood -Chemistry, Ultrastructure, Reactions;
- -Sulfite Science and Technology;
- -Quality of Effluents from the Neutral Sulphite Pulping of Oilseed and Linen Flax Fibres.



Francis Yuen

cc: Jim Armstrong
fy/111

DISTRICT OF SURREY
Planning and Development Services

14245 - 56th Avenue, Surrey
British Columbia, Canada V3W 1J2

Telephone
(604) 591-4441

JOHNNY CARLINE, Director

Fax
(604) 591-2507

December 20, 1990

File: 2125-601

003937

BRITISH COLUMBIA
ENVIRONMENT
JAN 02 1991
ENVIRONMENTAL IMPACT
ASSESSMENT BRANCH
VICTORIA, B.C.

Mr. David Parsons
MPRP Coordinator
Environmental Assessment Branch
B.C. Environment
777 Broughton Street
Victoria, B.C. V8V 1X5

Dear Mr. Parsons:

Re: Major Project Review Process - Arbokem Inc.

Your letter to Mr. Wayne Vollrath, Municipal Clerk, was referred to me for attention and response.

The prospectus prepared by Arbokem Inc. regarding the proposal to build a flax pulp mill in the Port Kells Industrial Area of Surrey, and certain relevant material, was circulated to those municipal departments and local agencies that could have concerns about such a project.

For your information, I am forwarding the attached responses received to date:

1) Inter-office memo from Mr. Ken Bennett, Environmental Officer, Engineering Department.
2) Inter-office memo from Chief Seter, Fire Chief.

The response from the Environmental Officer was preliminary or draft comment prepared before the public information meetings, and before other information on this project was available to us. However, we believe these comments are still valid, and see no reason to change them. The Fire Chief is basically highlighting regulations that are relevant to this project.

With regard to public response, there appears to have been none other than that made at the two public information meetings.

Consequently, it is our opinion that the Arbokem proposal is a permitted use on the subject site, and should be an acceptable development provided that it adheres to all relevant regulations.

Yours truly,

F.A. Wiles

Franklin Wiles
Manager of Special Projects

FAW:fw
WPPLNFAW 29

cc. Municipal Clerk
Environmental Officer
Fire Chief

INTER-OFFICE MEMO

TO: Business Advisor & Special Projects Manager PLANNING

FROM: Environmental Officer FILE: 4550-100

DATE: November 8, 1990

RECEIVED
NOV - 9 1990
PLANNING
Fw to 4550-00

Re: Review of the MPRP Prospectus Report:
"Bleached Flax Pulp Mill"
Arbochem Inc., October 1990

Introduction

This report outlines a new patented process for producing pulp from flax. The mill is small scale, producing 20 tonnes per day of flax pulp for export. The process is claimed to be pollution-free as there is very little effluent, easy to control air emissions and waste products that can be utilized in other products. The proponent is considering property in the Port Kells Industrial Park at 19520 Telegraph Trail. The export pulp is used to produce fine grade paper for currency and Bibles.

Discussion

For brevity, the following comments pertain to specific statements in the report. The reader is directed to these statements for background rather than explaining them here.

Section 3.3.1

The key to Arbochem's proposal and limited effluents and wastes is the use of potassium-salts rather than sodium-salts. The proposal, however, also states there could be a market for the wastes from the sodium based process, i.e., Na - lignosulphonate, for use as a component in a new road base product, "B.C. Stabilizer", developed by the B.C. Ministry of Transportation & Highways. It is not clear to what extent the Na-based salts will be used and what volumes of the Na-lignosulphonate waste will be generated.

This is an important distinction as it would mean the site would generate and need to store and transport large volumes of this material, thereby increasing the risk of spills. This aspect of the operation, however, could be adequately contained, but these provisions are not described. If the company plans to go into this process, then adequate space and provisions must be made to accommodate the volumes. The material is not a serious environmental or fire hazard threat, but spill containment and contingency plans would be required.

Section 3.3.4

Chlorine is not used in the bleaching process. Oxygen and hydrogen peroxide is used instead. This is a major point in the proponent's favour as this alleviates any concern for dioxin and furan production.

Section 4.2.1

The flax (as explained at a subsequent meeting) arrives as densely packed bales and will be stored in a totally enclosed warehouse. There would be concern for potential fire and explosion hazard from a dust laden atmosphere, but this could be easily controlled. The proponent should review fire suppression considerations with the Fire Department.

Section 4.2.2, Section 4.2.3, and Section 4.3.2

Storage of the chemicals listed is not described, but again this could easily be accommodated. This needs to be described to ensure adequate pollution control and fire protection measures are put in place.

Section 4.4.1

A permit for discharge to the sanitary sewer will be required, but should not be a problem. The cooling water component, however, may not be accepted to the sanitary sewer due to the volume. The cooling water will likely be directed to the storm sewer. The cooling water should be analyzed (or assurances given) to ensure there are no contaminants. The site should be checked for services with respect to water consumption and, particularly, storm sewer service.

The containment basins should be designed to hold a minimum of 110% of the largest volume stored plus 10% of the total remaining volumes.

There is also mention of the boiler cleaning chemicals being collected into the fertilizer. Is this acceptable?, if not, it is not acceptable as a storm sewer discharge as an alternative.

Section 4.4.2

The air emission controls sound good, but details would be required. Overall, it seems air emissions will not be a great concern.

Section 4.7 (Noise)

Although high speed equipment will not be in use, thereby eliminating high frequency bothersome noise, any low frequency noise could be bothersome too and difficult to control. Noise should not be a problem, but this aspect should be fully addressed.

Section 4.8

Dust control should be described. Mr. Wong has indicated this would not be a problem as the bales of flax are not broken down for use. There, apparently, does not seem to be a need for cyclones and baghouses but this could be a requirement if dust control is deemed necessary for the interior environment. This may have some noise considerations, but again, it could be controlled.

Conclusion

The flax pulp mill proposal does not have any major environmental concerns. Those described here should be easily controlled.

Recommendation

The proponent should provide to the MPRP a detailed description of a similar plant elsewhere to substantiate the claims made.

The prospectus, although lacking in some details, should be accepted for "approval in principle" in the MPRP, but a second review should be conducted once the public has had an opportunity for input. This brief review does not absolve the proponent from meeting the requirements of other Surrey departments and other agencies, nor is it a complete endorsement. An approval in principle seems reasonable at this point, but further details will be required.

Ken Bennett

Ken Bennett, B.Sc., R.P. Bio.
Environmental Officer

KGB/dr
eg2doc4033

SURREY
BRITISH COLUMBIA

INTER-OFFICE MEMO

RECEIVED
DEC 19 1990
PLANNING DEPART

FW | FW | 2125-6
2152-09

TO: FRANKLIN WILES, MANAGER OF SPECIAL PROJECTS

FROM: FIRE CHIEF

FILE: 2152-09820
2125-601 (19520 - 09820)

DATE: December 18, 1990

Re: Proposed Flax Pulp Mill by Arbokem Inc. in Port Kells Industrial Area (19520 Telegraph Trail)

The Fire Department has the following comments and concerns about this project:

1. The raw flax storage area, the pulp storage area and any other area where combustible fibres are stored or handled shall comply with Section 5.11 of the B.C. Fire Code.

2. All areas which contain dust producing processes shall comply with Section 5.10 of the B.C. Fire Code.

3. Tanks containing flammable liquids, combustible liquids and hazardous liquids shall comply with the requirements of the Surrey Fire Bylaw and the B.C. Fire Code.

4. There is an indication that the waste liquid fertilizer product is spontaneously combustible in solutions with low water concentration. The application must provide the Fire Department with the characteristics of this product as well as details of the storage, handling and safety procedures which will be used.

5. A 6 meter wide Fire Department access and a turnaround for Fire Department vehicles meeting the requirements of sentence 3.2.5.2(6) of the B.C. Building Code shall be provided for the flax storage building and the warehouse.

6. A fire hydrant must be provided within 45 m of each Fire Department sprinkler and standpipe connection as per sentence 3.2.5.2(3) of the B.C. Building Code.

7. Fire Hydrants shall be provided to meet the fire flow requirements of the site as per the requirements of District of Surrey Engineering Department Design Criteria Manual.

8. Areas where combustible fibres are stored or handled must be sprinklered to meet the requirements of NFPA 13

9. All hazardous materials, processes and operations that involve a risk from explosion, high flammability or related conditions which create a hazard to life safety shall comply with Part 5 of the B.C. Fire Code.

H.G. Seter
FIRE CHIEF

PS/HGS/add

Government of Canada / Gouvernement du Canada

Province of British Columbia

December 19, 1990

Doug Dryden
Frank Blassetti
Co-Chairmen
Major Project Steering Committee
Environmental Assessment Branch
B.C. Environment
777 Broughton Street
Victoria, B.C.
V8V 1X5

Dear Sirs:

RE: Arbokem INC.
Bleached Flax Pulp Mill

With reference to your letter of November 6, 1990. The proposal does not fall within the Fraser River Estuary Management Program's (FREMP) jurisdiction. We expect that interested FREMP agencies will provide input directly.

Sincerely,

A. C. Duncan

Adrian C. Duncan
Chairman
Environmental Review Committee

BRITISH COLUMBIA
ENVIRONMENT
JAN 04 1991
ENVIRONMENTAL IMPACT
ASSESSMENT BRANCH
VICTORIA, B.C.

/erc1212

Province of British Columbia

Ministry of Agriculture and Fisheries

MEMORANDUM

January 8, 1991

Ms. Sharon Daly
Senior Coordinator
Environment Assessment Branch
Ministry of Environment
777 Broughton Street
Victoria, British Columbia
V8V 1X5

BRITISH COLUMBIA
ENVIRONMENT
JAN 14 1991
ENVIRONMENTAL IMPACT
ASSESSMENT BRANCH
VICTORIA, B.C.

Arbokem Inc. - Flax Pulp Mill

094050

- Flax straw for pulping is an established process.

- To our knowledge, the Kimberly Clark, New Jersey and Esusta, North Carolina, mills are the only ones currently operational in Canada. Both mills integrate flax straw with other products.

- Flax is not produced in any significant quantity in British Columbia. Climate and land value considerations make British Columbia an unlikely source of supply for the proposal.

- The volume @ 20 tonnes a day is tiny when compared to wood pulping processes. This ministry is unable to comment on the environmental aspects relating to the manufacturing process itself.

- The statements made by the proponent relating to flax production and straw management are correct. The strong fibers of flax make the straw very difficult to incorporate into the soil after harvest. Most straw is currently burned as a result.

- The small amount of flax straw currently marketed is usually purchased by manufacturers straight from the farmer as described in the Canadian Geographic article appended to the prospectus.

- There is no record or evidence of any flax straw usage in recent years in British Columbia. In the early years of European settlement, there is some evidence of flax straw usage in subsistence linen manufacture.

.../2

Recycled Paper

- The proposed use of residues as agricultural fertilizer (page 20) is acceptable.

- In general, the proposal as outlined would not have a significant impact on this ministry's interests.

For further information, please contact Larry Bomford, Director, Policy Branch at 387-7180.

D. M. Matviw
Executive Director
Policy and Legislation

cc: Mr. W. Wickens
Mr. R. Bertrand
Mr. A. Helmersen

Province of British Columbia

Ministry of Regional and Economic Development

MEMORANDUM

BRITISH COLUMBIA
ENVIRONMENT
JAN 18 1991
ENVIRONMENTAL IMPACT ASSESSMENT BRANCH
VICTORIA, B.C.

To: David Parsons
MPRP Coordinator
B.C. Environment

Date: January 21, 1991

Re: Arbokem (Canadian Flax Pulp Ltd.)

The Ministry of Regional and Economic Development has now completed its review of the Arbokem Prospectus, and recommends that MPRP approval-in-principle be given to Arbokem's proposed flax pulp mill. In our view, no significant technical or socio-economic issues have emerged which cannot be addressed as a condition of project approval.

Arbokem's project is supported by this Ministry as it will contribute to this Ministry's objectives of promoting the small business sector, diversifying the provincial economy, and promoting innovative technology. By utilizing flax straw fibre which would otherwise be burnt, and by incorporating environmentally sound pulping and bleaching technologies, this project will also contribute to sustainable development.

The proponent has not sought financial assistance from the Ministry for this project. No provincial funds will be required to extend infrastructure services to the proponent's preferred site.

MRED has concerns that the market for the potassium liquid fertilizer byproduct has not been confirmed, and that the proposed use of the spent pulping liquor for road stabilization purposes is only in the early stages of commercialization.

MRED believes these issues should not prevent approval-in-principle for the project, but that the approval-in-principle be subject to Arbokem identifying a satisfactory means of disposing any unsold potassium liquid fertilizer byproduct and/or spent pulping liquor.

W.E. Freeman
Director
Industrial Development and
Policy Branch

Province of British Columbia

Ministry of Municipal Affairs Recreation and Culture

MEMORANDUM

File: 610.7

December 20, 1990

David Parsons
MPRP Coordinator
Environmental Assessment Branch
B.C. Environment
777 Broughton Street
Victoria, B.C. V8V 1X5

Re: Arbokem Inc. Flax Pulp Mill Prospectus

Further to the November 7, 1990 request from Doug Dryden, we have completed our review of this Prospectus and offer the following comments for consideration.

In section 4.9 (p.21) the project proponent makes a commitment to undertake the archaeological site inspection noted in our September 17, 1990 review comments on the draft Prospectus for this project. Therefore, the Archaeology Branch will be in a position to make a recommendation with respect to granting approval in principle for this project once the results of the archaeological site inspection are reported to the Branch.

Should you have any questions concerning these comments, please call me at 356-1438.

BRITISH COLUMBIA
ENVIRONMENT
DEC 21 1990
ENVIRONMENTAL IMPACT
ASSESSMENT BRANCH
VICTORIA, B.C.

R.A. Kenny
Senior Coordinator
Resource Management
Archaeology Branch

pc: S. Acheson
D. Suttill

003861

Province of British Columbia

Ministry of Forests

MEMORANDUM

To: David Parsons
MPRP Co-ordinator
Ministry of Environment
Policy and Planning Branch
777 Broughton Street
Victoria, B.C.
V8V 1X5

From: Industry Development Branch

Date: January 9, 1991

Our File: 204-20 MPRP

Your File:

RE: Proposed Arbokem Inc. - Bleached Flax Pulp Mill

The Ministry of Forests has no concerns with this proposal as no forest resources are used in the process.

The proposed pulp mill, as outlined in the prospectus, will have little or no impact on the environment and therefore appears to be a desirable project. It will produce a high valued product and create jobs in the Vancouver area.

Viggo Holm
Industry Specialist

BRITISH COLUMBIA
ENVIRONMENT
JAN 11 1991
ENVIRONMENTAL IMPACT
ASSESSMENT BRANCH
VICTORIA, B.C.

4055

Province of British Columbia

Ministry of Transportation and Highways

MEMORANDUM

Mr. D. Dryden
Co–Chairman
Major Project Steering Committee
B.C. Environment
Parliament Buildings
Victoria, BC V8V 1X5

January 7, 1991
Highway Planning
3A, 940 Blanshard St.
Victoria, BC V8W 3E6

387–5251

Re: Arbokem Inc. Flax Pulp Mill Prospectus Review

The Ministry of Transportation and Highways has reviewed the Arbokem Inc. Flax Pulp Mill Prospectus as requested by your November 7, 1990 memo, and has no objections in general. However, enclosed are comments made by the Regional Manager of Planning for the South Coast Region concerning the proposal.

If you have any questions please contact me at 387–3495.

T. Stevens
Director, Highway Planning

Jim N. Hester
Manager, Systems Planning

004033

JNH/ML/smo

Attach:

BRITISH COLUMBIA
ENVIRONMENT
JAN 09 1991
ENVIRONMENTAL IMPACT
ASSESSMENT BRANCH
VICTORIA, B.C.

Recycled Paper

Province of British Columbia
Ministry of Transportation and Highways

MEMORANDUM

Jim Hester
Manager, Systems Planning
VICTORIA

December 6, 1990
South Coast Region

Re: Arbokem Inc. Flax Pulp Mill Prospectus Review

1. There is no discussion of how raw materials including the process chemicals will be delivered to the site. The CN Main line is adjacent but delivery would require construction of a rail siding.

2. If delivery of chemical is by road, Surrey has the power to direct the routing in the Transportation of Dangerous Goods Act.

3. Freeway access would be via Rte. 15 (176th St.) or 200th St. interchanges. Ultimately 96th Ave. may be extended across the Freeway.

4. In terms of MOTH jurisdiction, the proposed site is outside the 800 m zone defined in Section 57, consequently site approval is totally a Surrey issue.

5. The arrival of material for construction could entail inspection at the 160th St. scales.

I expect the District Highways Manager will comment directly.

D.R. Parkes
Regional Manager, Planning
South Coast Region

DRP/lef

Ministry of Trans. & Highways
SYSTEMS PLANNING SECTION

DEC 11 1990

ANS: _____
NOTED: _____
DATE: _____

Recycled Paper

Province of British Columbia

Ministry of Energy, Mines and Petroleum Resources

MEMORANDUM

David Parsons
MPRP Coordinator
Environmental Assessment Branch
Ministry of Environment

November 30, 1990

COMMENTS ON ARBOKEM INC. FLAX PULP MILL PROSPECTUS

Thank you for the opportunity to review the above. The Ministry of Energy, Mines and Petroleum Resources is satisfied with the contents of the Arbokem Inc. prospectus and supports approval-in-principle at this stage of the Major Project Review Process.

The proponent's commitment to incorporate energy efficient features into plant design (page 14) is commendable. Mr. John Hougan is B.C. Hydro's representative for new plant energy assessment. Arbokem Inc. should pursue this matter by contacting him at 663-4580 for further information. Arbokem Inc. should also contact B.C. Hydro and BC Gas Inc. to confirm their view that existing utility infrastructure at the preferred site is adequate to meet the needs of the proposed mill.

Please contact me at 387-1916 or Niall Mc Millan, Project Analyst, Energy Project Analysis Branch, at 356-2169 if you have any questions about the above.

Peter Ostergaard
A/Assistant Deputy Minister
Energy Resources Division

cc: Mr. J. Hougan
Program Manager,
Industrial Marketing
B.C. Hydro

Mr. D. Griffin
MPRP Coordinator
Regional Planning and
Infrastructure Branch
Ministry of Regional and
Economic Development

003462

Recycled Paper

Province of
British Columbia

Ministry of
Health

1515 Blanshard Street
Victoria
British Columbia
V8W 3C8

BRITISH COLUMBIA
ENVIRONMENT
JAN 11 1991
ENVIRONMENTAL IMPACT
ASSESSMENT BRANCH
VICTORIA, B.C.

January 9, 1991

Mr. David Parsons, MPRP Coordinator
Environmental Assessment Branch
B.C. Environment
777 Broughton Street
Victoria, B.C.
V8V 1X5

004063

Dear Mr. Parsons:

Re: Arboken Flax Pulp Mill Prospectus

The Ministry of Health has reviewed the Prospectus to ascertain any impacts of this project on public health.

This document describes a process which appears to have no public health significance. The location and quantity of the output (20 T/D) and the types of chemicals would classify this operation as acceptable according to the Surrey Medical Health Officer, Dr. W. Meekison.

Nevertheless, this Ministry will keep the file open until an approval-in-principle (AIP) is issued. In the interim period any changes or additions to the Prospectus or release of additional documents may materially alter our assessment. Accordingly, please advise this Ministry of any new information or status changes.

Yours truly,

B. A. Willoughby
Manager
Public Health Protection

c.c. Dr. W. Meekison
Medical Health Officer
Boundary Health Unit

Mr. John Philion
Policy, Planning, and Legislation

BAW/ln
1119I

Province of British Columbia

Ministry of Parks
VICTORIA, B.C.

MEMORANDUM

Date: January 14, 1991
File: 3-16-1-13

Mr. Doug Dryden
Co-Chairman
Major Project Steering Committee
B.C. Environmental Assessment Branch
Parliament Buildings
Victoria, British Columbia
V8V 1X5

RE: ARBOKEM INC. FLAX PULP MILL PROSPECTUS REVIEW

In response to your memorandum dated November 7, 1990, the Ministry of Parks has no comments or concerns on the prospectus.

Thank you for the opportunity to provide comments.

Dr. Louise Goulet
Manger, System Planning
and Policy

BRITISH COLUMBIA
ENVIRONMENT
JAN 15 1991
ENVIRONMENTAL IMPACT
ASSESSMENT BRANCH
VICTORIA, B.C.

994107

Recycled Paper

Province of British Columbia

Ministry of Native Affairs

MEMORANDUM

To: Mr. David Parsons
MPRP Coordinator
Environmental Assessment Branch
B.C. Environment

January 15, 1991

Re: Arbokem Inc. Flax Pulp Mill Prospectus

Thank you for your memorandum of November 7, 1990 on the above-mentioned project.

The proposed site of this project falls within the traditional territory of the Musqueam people. I suggest that Arbokem provide the Musqueam Band with the opportunity to submit comments and suggestions regarding potential economic, engineering, environmental and cultural impacts from developing the mill. To date, the Federal Government has not considered this area acceptable for negotiation as a comprehensive claim. However, the Federal Comprehensive Land Claims Policy is currently under review, and it is therefore possible that the claim of the Musqueam people could be negotiated in the future.

The Musqueam Band is a member of the Alliance Tribal Council, which represents a number of Native Bands in the lower mainland area. The Proponent should consult with both the Musqueam Band and the Alliance Tribal Council to identify any concerns which may arise regarding this project. Such consultation and cooperation early on will reduce the likelihood of conflict at later stages of development. In addition, efforts should be made to hire qualified Native people where possible.

It would greatly benefit the Proponent to establish consultation mechanisms and good working relationships with the Musqueam people. For your information, I have attached the names and addresses of a number of contacts. If possible, I would like to be kept informed of discussions between Arbokem Inc. and the Musqueam Band.

Thank you for the opportunity to comment on this proposed development.

Nicholas P. May
Director
Natural Resource Management

Attachment

BRITISH COLUMBIA
ENVIRONMENT
JAN 17 1991
ENVIRONMENTAL IMPACT
ASSESSMENT BRANCH
VICTORIA, B.C.

004154

Chief Wendy Grant
Musqueam Indian Band Office
6370 Salish Drive
Vancouver, B.C.
V6N 2C6

Tel: (604) 263-3261
FAX: (604) 263-4212

The Alliance Tribal Council
6615 Salish Drive
Vancouver, B.C.
V6N 4C4

Tel: (604) 263-1975
FAX: (604) 263-4201

Other Member Bands:

Burrard
Homalco
Katzie
Klahoose
Nanaimo
Squamish
Tsawwassen

Province of British Columbia

Ministry of Social Services and Housing

CORPORATE SERVICES DIVISION

MEMORANDUM

Parliament Buildings, Victoria, British Columbia V8W 1A4

December 20, 1990

BRITISH COLUMBIA
ENVIRONMENT
DEC 28 1990
ENVIRONMENTAL IMPACT
ASSESSMENT BRANCH
VICTORIA, B.C.

Mr. David Parsons
MPRP Coordinator
Environmental Assessment Branch
B.C. Environment
777 Broughton Street
Victoria, British Columbia
V8V 1X5

033805

Re: Arbokem Inc. Flax Pulp Mill Prospectus Review

In response to your request of November 7, 1990, the Ministry of Social Services and Housing has no objection to the project proceeding. At the later stages, the Ministry requests that consideration be given to the hiring of persons in receipt of income assistance benefits.

Further enquiries in this regard may be directed to the Regional Director for the Fraser south district, Ms. Jean Macdonald, #105-5796 Glover Road, Langley, telephone 530-4341.

M. A. Thomas
Policy Analyst

cc: Ms. Jean Macdonald, Regional Director, Region D

MAT:DCM

Recycled Paper

Province of
British Columbia

Ministry of
Education
SCHOOL FACILITIES
BRANCH

620 Superior Street
Victoria
British Columbia
V8V 2M4

December 13, 1990

BRITISH COLUMBIA
ENVIRONMENT
DEC 14 1990
ENVIRONMENTAL IMPACT
ASSESSMENT BRANCH
VICTORIA, B.C.

Mr. D. Parsons
MPRP Coordinator
Enviromental Assessment Branch
B.C. Environment
777 Broughton Street
Victoria, British Columbia
V8V 1X5

003733

Dear Mr. Parsons:

Re: Arbodem Inc. Flax Pulp Mill Prospectus Review

As described in the prospectus, the proposed Arbodem Inc. Flax Pulp Mill should not affect the delivery of education programs in the Surrey area in any significant way.

The Ministry of Education has no other comments on the Arbodem Inc. Flax Pulp Mill Prospectus.

Yours truly,

L.K. Hunt
Manager - Project Control
School Facilities

LKH

c.c. K. Miller, Director,
School Facilities Branch

Recycled Paper

Province of British Columbia

Ministry of Crown Lands

MEMORANDUM

DEC 19 1990

2575

To: Mr. Derek Griffin
Major Projects Review
Process Coordinator
Industrial Development and
Policy Branch
Ministry of Regional and
Economic Development

Date: 90-12-18

File: 11425-30-004

C03862

BRITISH COLUMBIA
ENVIRONMENT
DEC 21 1990
ENVIRONMENTAL IMPACT
ASSESSMENT BRANCH
VICTORIA, B.C.

Re: Arbokem Inc. - Flax Pulp Mill Prospectus

Our Lower Mainland Region reviewed the Prospectus and have no concerns relative to the Major Projects Review Process. The proposal is on private land within the Port Kells Industrial Park and does not appear to impact any adjacent Crown lands.

Lynn Kennedy
Manager
Policy and Documentation Section

Recycled Paper

APPENDIX 3

Public Comments

West Coast Environmental Law Association
1001-207 West Hastings St., Vancouver, BC V6B 1H7
Phone: (604) 684-7378; Fax: (604) 684-1312

William J. Andrews — Barrister & Solicitor, Executive Director
Calvin Sandborn — Barrister & Solicitor
Ann Hillyer — Barrister & Solicitor

December 6, 1990

PREVIOUSLY FORWARDED TO YOU BY TELECOPY

Mr. David Parsons
MPRP Coordinator
Environmental Assessment Branch
B.C. Environment
777 Broughton Street
Victoria, B.C.
V8V 1X5

and

Mr. Al Wong
President, Arbokem Inc.
Suite 101 - 358 East Kent Ave. South
Vancouver, B.C.
V5X 4W6

BRITISH COLUMBIA
ENVIRONMENT
DEC 11 1990
ENVIRONMENTAL IMPACT
ASSESSMENT BRANCH
VICTORIA, B.C.

003641

Dear Sirs:

Re: Proposed flax pulp mill in Port Kells

Thank you for forwarding to us a copy of the Prospectus prepared by Arbokem Inc. in connection with its proposed flax pulp mill.

Our initial comment is regarding the review process for this project. We have reviewed the Prospectus, but on the basis of the information provided, it is impossible to determine whether this project should proceed without further environmental review. We would appreciate receiving copies of the comments from all government agencies who have conducted a technical review to determine if the proposed project would cause a significant environmental impact. This information might deal with our concerns about the need for a technical analysis of the potential environmental impact of the proposal, conducted by someone other than the proponent. At this point, without the benefit of that information, we cannot recommend that this project be approved in principle.

We realize that this proposal is for a pulp mill significantly smaller than the usual size of pulp mills in B.C. We are pleased to see that the proponent is planning a

printed on recycled paper

mill which may have a low environmental impact compared to other pulp mills in B.C., because of its size and because it will be largely effluent-free.

However, this proposed project, if built, would use technology not presently in operation in the province. The project would also involve the storage and use of a number of hazardous materials. Therefore, in spite of this being a proposal for a relatively small project, we recommend that a complete environmental impact statement be prepared by the proponent so that the potential environmental impacts of this proposed pulp mill can be properly assessed prior to construction.

The Prospectus provides an outline of the project but is not intended to provide detailed environmental impact information. We are aware that this is not a requirement at the Prospectus Stage of the Major Project Review Process. However, since this is relatively unknown technology, we are of the view that more complete information should be made available by the proponent so that the potential environmental impact of this proposal can be properly assessed. This information should include a discussion of what alternatives will be employed if the project does not successfully operate as planned.

As you are aware, there have been significant environmental problems in British Columbia as a result of pollution from pulp mills. In many cases, pollution problems have arisen during start-up and when mills fail to operate as planned. Therefore, it is extremely important that detailed information be provided and assessed prior to construction to ensure that any avoidable problems are resolved in advance of the project coming into operation.

We urge the Major Project Steering Committee to require the company to provide an environmental impact statement in a Stage I Report so that all interested parties are fully informed about the project prior to construction.

Yours very truly,

WEST COAST ENVIRONMENTAL LAW ASSOCIATION

Ann Hillyer
Barrister & Solicitor

AEH/dr
90\12\h06dpaw

UNITED FISHERMEN AND ALLIED WORKERS' UNION

#160 - 111 VICTORIA DRIVE,
VANCOUVER, B.C. V5L 4C4
(Maritime Labour Centre)

TELEPHONE: 255-1336
TELEX: 04-54624
BENEFIT FUNDS: 255-8771
FAX: 255-3162

UFAWU

December 7, 1990

BRITISH COLUMBIA
ENVIRONMENT
DEC 14 1990
ENVIRONMENTAL IMPACT
ASSESSMENT BRANCH
VICTORIA, B.C.

Mr. David Parsons
MPRP Coordinator
Environmental Assessment Branch
B.C. Environment
777 Broughton St.
Victoria, B.C. V8V 1X5

003729

Dear Sir:

Re: Arbokem Inc./CFP Proposed Bleached Flax Pulp Mill

The UFAWU, comprising some 6,000 members whose livelihood is based in large part on Fraser River salmon, is concerned that waters and fish habitats in the Fraser estuary and tributary streams be maintained in clean, healthy condition.

Having studied Arbokem's prospectus, (dated Oct. 90) we suggest that potential risks to our interest cannot be assessed on the basis of information provided. Accordingly we hereby request that you require the proponent to prepare for public scrutiny an environmental impact assessment document detailing (but not limited to) the following items:

1. Site Characteristics: topography, surface drainage (streams and storm water system), soil drainage and groundwater movement, slope stability.

2. Spill Contingencies: for process chemicals (in storage and in process) and for liquid waste products and liquid effluents: design contingencies to prevent, retain, recover and mitigate damage from, spills in a "worst case" scenario and under normal operating conditions.

3. Product Market Assurance: hard evidence that "potassium-based liquid fertilizer" will in fact be removed from the site and NOT become "potassium based liquid effluent", which would ultimately be discharged to the estuary or Straits of Georgia.

Thank you for your assistance in this matter.

Yours sincerely,

A. G. Thomlinson
Environmental Director

AT/nk oteu-15

003157

BRITISH COLUMBIA
ENVIRONMENT
NOV 20 1990
ENVIRONMENTAL IMPACT
ASSESSMENT BRANCH
VICTORIA, B.C.

November 15, 1990

Mr Alfred Wong

President Arbokem Inc.
101
358 East Kent Avenue S
Vancouver.
B.C,
V5X 4W6

Mr David Parson
MPRP Coordinator
Environment Suite
B.C Environment
777 Broughton Street
Victoria B.C
V8V-1X5

Dear Mr. Wong.

It was a pleasure and privilege to attend your meeting at the Surrey Inn.To day I have studied your "Bleached Flax Pulp Mill Prospectus".

As you know I started up the Flax Pulp Mill in Beauharnois , Quebec in 1943 and had the responsibility , as Assistant Manager of that mill , until 1951, in the making and integrated use, in fine grades of paper.

I then managed the start ups of the Dissolving Pulp MIll at Prince Rupert and subsequently the Island Paper Mills, of which I had been the initiating advocate.

After further activity as V.P and then President of the E.B.Eddy Company, I have done studies under the name of W.C.R Jones Ltd. Volunteer job assignments have taken me to Indonesia,Tunisia, Portugal, Mexico and twice to the many small mills of Heilongjiang Province , in the extreme North East China. The growth and use of Flax fibre was strongly recommended in China.

In Canada I have written reports for Saskatchewan and Manitoba. In both these studies " Small Mill" concepts have been advanced.

Flax has clearly been an important part of my experiences , and recommendations..

Amongst other activities I assembled an "International real estate site" with 50 acres in Canada and 120 in the U.S.A., in juxtaposition.It is in Central B.C.

The site has major, rail ,road. gas and electricity facilities immediately available , and a light plane landing strip. A river is the Eastern border .

This assembly was done prior to the ' Free Trade " agreement.When I found that I was, then, not able to get my small mill concept going, one large industrial company bought the whole thing and has subsequently asked"Jones" to continue seeking development.I still so endeavour.

The only Flax development that I now hear being booted around, other than Arbokem"is a building board , made of whole , undecorticated straw.I have no current report on this.

I sincerely congratulate Arbokem on the Potassium Alkali Sulphite concept ,both in the cooking and in the "Fertilizer,ideas.These are very good indeed.

Before getting a copy of the Prospectus I had worked out a Capital Cost etc of this plant,

thinking it to be an integrated pulp and paper plan

.

It is evident that certain cost disadvantages exist in having this plant in B.C , rather than adjacent to the fields of this fibre.I once advocated, to Manitoba, that they make use of facilities existing ,but shut , both in handling the fibre and in paper making.

I am in correspondence with people who have shut equipment and with long experience in the "Rag grades".. I anticipate response that might affect the"Jones" land problem, or even interest Arbokem .

While one cannot anticipate that Canada is going to return top the volume of Banknote, as existed prior to the metal "Looney" or compete in cigarette paper, it seems very clear that the increasing population of the North Western American Continent, will bring increasing need of " permanent papers" for all sorts of prestige documents.

In looking at the flow sheet, page 8 and the map of the" preferred site"' one is moved to questions as to the type of evaporation and perhaps the form of pulp drying,and then, most important, the selection of site.

This last point is raised as I cannot be satisfied that a non integrated flax pulp mill will long be considered the ideal situation, even if the international market for pulp strengthens, as is hoped.

If in the future an integrated pulp -paper operation evolves, as I would expect, then this site may be unable to make economic pumped wet stock delivery to papermaking, and might involve larger " settlement areas" than can be provided.

When actual design is undertaken I believe that I might be able to assist in avoiding some errors that were experienced elsewhere, and I would appreciate being so considered,

.

Sincerely

W.C.R.Jones "Ray"
Apt 605 5562 Balsam St
Vancouver B.C. V6M 4B7
Phone. (604) 261-1638

Mike Smith,
Box 511,
Lister, B.C. V0B 1Y0

December 11, 1990.

Mr. Al Wong,
Suite 101,
358 E. Kent Ave.,
Vancouver, B.C.
V5X 4W6

Dear Mr. Wong:

Further to our telephone conversation of December 5, 1990 regarding your venture into a Flax Fibre Plant.

As Creston Valley is very environmentally conscious I am confident your proposed plant would be very beneficial. This would be a very good alternative to our present way of dispensing of the straw, which is by burning. We, therefore, would be very interested in supplying your plant with Flax Fibre. Please let me know at your earliest convenience if you would be interested in our Flax.

May I take this opportunity to wish you success in your new venture.

Yours truly,

Mike Smith.

ss

December 4, 1990.

Al Wong,
Arboken Inc.,
Ste. 101, 358 East Kent Ave.,
Vancouver, B.C.
V5X 4W6

Dear Sir:

I am writing this letter in support of the Flax Mill Project that Arboken is proposing to build in the Port Kells Industrial Park.

I was in attendance at the public meeting held November 13, 1990 at the Surrey Inn. The need for new technology in the pulp and paper industry is essential and will be welcomed by all British Columbians.

Having worked in pulp mills throughout the Province, I have witnessed the devastating effects that traditional methods of bleaching pulp can have on the ecology.

I wish you success in your efforts to introduce a procedure that is long overdue. Our future depends on it!

Yours truly,

Mark Derton

Mark Derton,
25650 Rogate Dr.,
Coquitlam, B.C.

OPPORTUNITIES NORTH

DEVELOPMENT THROUGH INVESTMENT IN
FORT ST. JOHN, TAYLOR, HUDSON'S HOPE AND AREA

9912 - 106th AVE.
FORT ST. JOHN, B.C.
V1J 2N9

TELEPHONE (604) 785-1810

November 29, 1990

Arbrokem Inc.
Attention: Al Wong, President
Suite 101, 358 East Kent Ave.
Vancouver, B.C.
V5X 4W6

Dear Mr. Wong:

Opportunities North is the Economic Development Commission in Northeastern British Columbia representing the City of Fort St. John, the Districts of Hudson's Hope and Taylor, and Electoral Areas "B" and "C".

Our mandate is to encourage new business start-ups that will help to diversify and strengthen the local economy as well as assist existing businesses in their local endeavours.

With this mandate in mind the Board of Directors read with interest about the Flax Pulp Mill proposed for Port Kells in the November 13, 1990 issue of the Province and the Nov. 26, 1990 issue of the B.C. Report.

We understand that Flax Pulp is ideal for thin dictionary and bible pages, cigarette papers, heavy duty bank notes and documents. We also understand that your pulping process is nearly emission free and that by-products of the process can be made into fertilizer. We have also heard that you are experiencing some resistance to building this mill from local residence.

It is for this reason that we are writing to you to express our interest in your project. Our organization would be interested in examining the benefits of establishing such a plant in our area. We believe that such a pulp mill could contribute to diversifying our economy. Also, the fertilizer by-product could be an asset to our huge agricultural sector in the North Peace.

We would appreciate any further information that you could send us in regard to the Flax Pulp Mill as we are interested in exploring the possibility of locating such a facility in our area. If you are ever considering building a second mill or have problems locating your mill in Port Kells please keep us in mind.

Enclosed please find a copy of our Economic Profile and an article published by the Trade and Commerce Magazine. This should better inform you of the benefits our area has to offer.

I look forward to hearing from you soon.

Yours truly,

Sherri Demers

Sherri Demers
Economic Development Officer

CS/cs
A:arebroke.m

OPPORTUNITIES NORTH
DEVELOPMENT THROUGH INVESTMENT IN
FORT ST. JOHN, TAYLOR, HUDSON'S HOPE AND AREA

SHERRI PHILLIPS - DEMERS
ECONOMIC DEVELOPMENT OFFICER

9912 - 108th AVE.
FORT ST. JOHN, B.C.
V1J 2N8
(604) 785-1810

RESIDENCE
(604) 785-0653

G&R INDUSTRIES LTD.

20 BRAID STREET
NEW WESTMINSTER, B.C. V3L 3P3
TELEPHONE: 524-3666
FAX: 524-5363

November 14, 1990

ARBOKEM INC.
Suite 101, 358 East Kent Avenue
Vancouver, B.C.
V5X 4W6

Telephone: 321-9331
Fax: 321-3043

Attention: Al Wong
President

I attended your introduction meeting at the Surrey Inn on Tuesday November 13, 1990, and am firmly convinced that this project should be one that is eagerly sought by the community at large.

I am very familiar with the raw product that your plant would be using, as some of my relatives are Flax producers in Saskatchewan, and I know of some of the problems related to getting rid of the flax fibre.

I indicated to you that we are a construction company, and work in the Industrial, Commercial field. We are capable of all types of construction, from site preparation, through concrete work, building, design, supply and erection, machinery search, and installation, to operating status.

We specialize in design, build contracts, or supply materials and labour to your design; we work to a fixed fee contract, lump sum contract or cost plus contract.

We are presently involved in the construction and equipment installation at Canfor Fibre Plant in New Westminster as well as several other projects, both large and small.

When you get to the point of approval in principal for your project, we would be pleased to meet with you, for the purpose of discussing construction of your plant.

I will keep in touch over the next few weeks, and if you have any questions, or if there is some area we can help, please don't hesitate to call.

Best Regards,
G. & R. INDUSTRIES LTD.

Jim Mitchell

Marubeni
CANADA LTD.

1630 - 505 Burrard St., Vancouver, B.C. V7X 1E5
Cable Address: MARUBENI VANCOUVER BC

Telephone: (604) 685-3331
Telex: 04-508819
Fax No.: (604) 681-0498

ARBOKEM INC.
SURREY B.C.

DEAR MR. ALFRED WONG,

I READ ABOUT YOU IN THE ARTICLE PRINTED IN THE PROVINCE ON NOVEMBER 13, 1990. I TRIED CALLING, BUT YOUR SECRETARY TOLD ME IT WOULD BE BETTER IF I WROTE TO YOU INSTEAD. THE REASON FOR THIS LETTER IS TO HOPEFULLY MEET WITH YOU AN BE ABLE TO DO BUSINESS TOGETHER.

ENCLOSED YOU WILL FIND MARUBENI'S ANNUAL REPORT FOR 1990. PLEASE ALLOW ME TO TELL YOU A BIT ABOUT OURSELVES. MARUBENI IS ONE OF THE LARGEST TRADING HOUSE'S IN JAPAN. WE HAVE A PULP DEPARTMENT IN OUR JAPAN OFFICE. AT THE MOMENT WE ARE IMPORTING FLAX PULP WHICH WE GET FROM SPAIN. WE ARE INTERESTED IN YOUR PRODUCT AND WOULD LIKE TO KNOW THE PRODUCT STAGE CAPACITY. WE ARE INTERESTED IN EXPORTING IT TO JAPAN AS WELL AS OTHER COUNTRIES.

IF YOU COULD GET BACK TO ME AT YOUR CONVENIENCE I LOOK FORWARD TO HEARING FROM YOU. MY NUMBER IS 685-3339.

REGARDS,

R. Miyakita

RYOJI MIYAKITA
MARUBENI PULP & PAPER DEPT.
VANCOUVER BRANCH.

December 6, 1990

Mr. David Parsons
Major Projects Review Committee
Environmental Assessment Branch
B. C. Environment Ministry
777 Broughton St.,
Victoria, B.C.
V8X 1X5 FAX 3567183

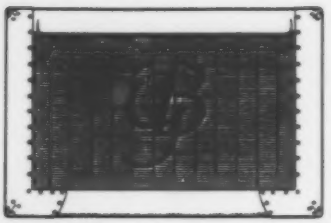
Dear Mr. Parsons,

I am writing on behalf of the Port Kells Community Association to express our concern over the proposed construction of a "bleached flax pulp mill" in the Port Kells industrial area of Surrey. While we have made ourselves familiar with the developer, Mr. Wong's, detailed prospectus, we have not been able to obtain any information on the impact such a development will have on the environment, in general, and our adjoining community, in particular. The technology proposed for this mill is apparently new to North America and we, therefore, have nothing with which we can compare the proposed mill. The process, we feel, needs to be thoroughly investigated by an impartial party. We also wish to express our dissatisfaction with the short amount of time in which we were required to respond to this mill proposal. Given the fact that our association meets only once a month, and given the lack of appropriate information on the proposed mill, the 30 day time limit on enquiries and responses is insufficient. This short time span renders the public consultation process much less effective.

Sincerely,
S. Cattermole
Sandra Cattermole
Secretary, Port Kells Community Assoc.
c/o 8850 Harvie Rd.,
Surrey, B.C. V3T 5J4

Copy to:
Mr. Al Wong, President
ARBOKEM Inc.
Suite 101,
358 E. Kent Ave., South
Van. B.C. V5X 4W6
FAX 3213043

By Appointment to Her Majesty The Queen
Hand-Made Paper Makers
Barcham Green and Company Limited
Maidstone



Barcham Green & Company Limited

Hayle Mill
Maidstone Kent England
ME15 6XQ

Telephone Maidstone (0622) 692266

Mr Al Wong
President
Arbokem Inc
Suite 101
358 East Kent Avenue
Vancouver
Canada V5X 4W6

14th December 1990

Dear Mr Wong

We have been interested to read of recent reports in 'Paper' magazine regarding your planned flax mill project. Please could you let us have information about the pulp when this is available and perhaps keep us apprised of the actual building programme itself.

By way of explanstion, I would mention that for many years until 1987 we used flax pulp from Spain for manufacturing handmade paper and although we are no longer manufacturers ourselves, we do trade in papers which contain flax. Indeed this letterhead, made at Hayle Mill, is 100% flax. The Spanish paper has suffered over the years from quite a lot of dark coloured shive and it would be useful to find an alternative source of supply of comparable physical characteristics. The Spanish pulp is Lincell A which you are probably familiar with.

We were also interested in the information about your potassium pulping process and wonder whether you have any details of the potassium content of the pulp itself based on research to date. The papers that we trade in are intended for very permanent applications such as archives and I am not sure that a high potassium content would be acceptable. Obviously the environmental aspects are very encouraging.

I look forward to hearing from you in due course and meanwhile remain

Yours sincerely

SIMON B GREEN

Directors Simon Barcham Green BSc Graham Clarke ARCA

Registered Office
Hayle Mill Maidstone
Registered in England No 1192703

APPENDIX 4

Arbokem Response to Government Agency Comments

ARBOKEM INC.
Suite 101, 358 East Kent Ave. South, Vancouver, B.C. V5X 4W6 Canada
Tel.: (604) 321-9331 Fax: (604) 321-3043

AK7296

To: Mr. W.E. Freeman
Director, Industrial Development and Policy Branch
Ministry of Regional and Economic Development
Victoria FAX: 1-356-8212

From: Al Wong/ Vancouver

Date: January 18, 1991

Re: Arbokem Proposed Flax Pulp Mill

I am writing to you in response to your January 18 letter to Mr. D. Parsons (MPRP Coordinator). I have noted your comments. Here is my reply to your principal query about the uncertain "disposal" of the liquid fertilizer co-product.

As you may know,our patented pulping technology is based on the novel economical disposal of the potassium-based effluent. Liquor burning or bio-treatment of the pulping/ bleaching effluent would be contrary to the principal claim of our patented process. Such conventional practices would certainly eliminate any future marketing opportunities for our patented process technology in Canada and abroad.

Therefore, we are committed to sell the pulping/ bleaching effluent as a value-added product, on a continuing basis. We are prepared to cease flax pulp production if we do not have a satisfactory market for our liquid co-product.

Fertilizer

Although specific firm contracts have not signed with any prospective buyers, we are confident that the potassium-based product can be sold and used readily for agriculture. For example, it is well know that potassium and sulphur (as present in the proposed liquid co-product) can improve the yield of oilseed crops such as flax and canola. In fact, a group of flax farmers in Creston has already approached us in November last year regarding regarding the sale of the Creston flax straw to our proposed flax pulp mill. Our potassium-based liquid fertilizer can be returned conveniently for use on the Creston flax farmers' own land.

BC STABILIZER

The BC STABILIZER is a technology invented by scientists at the Ministry of Transportation and Highways (MOTH). Its patented composition consists of asphalt emulsion and lignosulphonate (spent sulphite liquor). The technology is used principally for the stabilization of unpaved roads. This MOTH-developed technology has already been approved for general use, by MOTH and the Ministry of Environment in 1988.

As per attached letter,the Purchasing Commission has now awarded Arbokem the exclusive license to market the BC STABILIZER in Canada and abroad (except USA). Effectively, Arbokem would be the only B.C. company manufacturing the lignosulphonate component of BC STABILIZER, and would also have the sole rights to market the BC STABILIZER technology for the Provincial Government. MOTH and Arbokem believe that there is a considerable export market opportunity for the BC STABILIZER technology (and product).

We have already consulted with MOTH officials (Mr. Ludvik Mazuch, co-inventor of the BC STABILIZER technology, MOTH, at Tel: 387-4393). We understand that the potassium-based effluent can be used as the lignosulphonate component of the BC STABILIZER.

I hope that my reply has fully answered your principal query.

Copy: Mr. D. Parsons/ MPRP

Province of
British Columbia

PURCHASING COMMISSION

Ministry of Government
Management Services
and Minister
Responsible for
Women's Programs

Second Floor
4000 Seymour Place
Victoria
British Columbia
V8X 4Y3
Telephone: (604) 389-3300
Fax: (604) 387-6608 and 389-3370

January 17, 1991

Mr. Al Wong
President
Arbokem Inc.
Suite 101 - 358 East Kent Avenue
Vancouver, B.C.
V5X 4W6

Dear Mr. Wong:

Re: RFP #94195 - Marketing B.C. Stabilizer

I am pleased to advise that Arbokem Inc. was the successful bidder on the Request For Proposal described above, for both geographic areas specified in the RFP:

1) Eastern Canada;

2) Western Canada and the rest of the world except the U.S.A.

A formal Licensing Agreement will be subject to successful negotiations between Arbokem Inc. and the Province of British Columbia. A draft of the proposed Licensing Agreement will be sent to you for your review and comment as soon as it is available, probably within the next 30 days. If you have any questions or concerns in this regard, please contact Mr. Mac Culham, Policy and Program Development Branch, Purchasing Commission (389-3393).

Yours very truly,

Jim Guthrie
Purchasing Agent

pc: Larry deBoer, Ministry of Transportation and Highways
Ludvik Mazuch, Ministry of Transportation and Highways

JUL 05 '90 15:11 GEOTECHT VIC

Province of
British Columbia

NEWS RELEASE

MINISTRY OF TRANSPORTATION
AND HIGHWAYS

MINISTRY OF ENVIRONMENT
129/90

FOR IMMEDIATE RELEASE

JUNE 19, 1990

LIGNOSULPHONATES GIVEN GREEN LIGHT BY BRITISH COLUMBIA AND QUEBEC

Victoria - Rita Johnston, Minister of Transportation and Highways, and John Reynolds, Minister of Environment, today announced in a joint statement that lignosulphonates, used as road dust suppressants, have passed provincial toxicity tests and are acceptaable for use in British Columbia.

"The Ministry of Transportation and Highways called for a toxicity study of lignosulphonates after public concerns were raised last year when the Province of Quebec temporarily suspended the use of the material as a dust suppressant," said Johnston. "The Quebec ban was in effect until further laboratory and field studies could be conducted. The results of those studies, released by the Quebec Environment Ministry April 19, 1990, found lignosulphonates to be safe for the environment."

A B.C. Ministry of Environment study has also indicated that lignosulphonates are non-toxic. The B.C. report confirms the Quebec Ministry of Environment results, private industry evaluation and the original findings by the Ministry of Transportation and Highways.

"Lignosulphonates are to be used according to proper application practices," said Reynolds. "In our opinion, this concern is already addressed by our regulations. As a result of this report, the public can be assured there is no need for concern about the use of lignosulphonates in the Ministry of Transportation and Highways' road maintenance and construction operations."

.../2

"Lignosulphonates are an effective method of controlling dust," said Johnston. "The reports from both Ministries of Environment are timely with the advent of summer and the need to control dust on gravel roads."

The application of lignosulphonates or other dust suppressant materials will commence shortly as required on various roads throughout the province.

Lignosulphonates are a by-product of the pulp-making process. Lignin along with cellulose and hemicellulose comprise 20 - 30% of wood. Lignin is water insoluble and is extracted during sulphite pulping. The solution of lignosulphonate and wood sugars, called "spent sulphite liquor," is further processed. The type of process determines the type of lignosulphonates generated, which include ammonium, sodium, calcium and magnesium lignosulphonate.

Sodium or calcium lignosulphonates have many uses: as dust suppressants, in ore flotation, as additives to Portland cement and in animal feed. Lignosulphonates are preferred over other types of dust suppressants for use in environmentally sensitive areas. This dust suppressant has been in use in British Columbia since 1973.

- 30 -

For further information contact: Ministry of Transportation and Highways, Public Affairs, Victoria, 387-3198

or

Ministry of Environment, Harry Vogt, Victoria, 387-9931.

ARBOKEM INC.
Suite 101, 358 East Kent Ave. South, Vancouver, B.C. V5X 4W6 Canada
Tel.: (604) 321-9331 Fax: (604) 321-3043

AK7267

To: Mr. D.Y. Morrison
Acting Head, Technical Services
Ministry of Environment
Victoria FAX: 356-7197

From: Al Wong/ Vancouver

Date: January 14,1991

Re: Arbokem Proposed Flax Pulp Mill

I am writing to you in response to your December 6 letter to Mr. D. Parsons (MPRP Coordinator). I have noted your major comment regarding the uncertain "disposal" of the liquid fertilizer co-product.

As you may know, our patented technology is based on the novel economical disposal of the potassium-based effluent. Liquor burning or bio-treatment of the pulping/bleaching effluent would be contrary to the principal claim of our patented process. Such conventional practices would certainly eliminate any future marketing opportunities for our patented process technology in Canada and abroad.

Therefore, we are committed to realize the market for the effluent as a value-added fertilizer and/or as a component of the MOTH-patented BC STABILIZER road stabilization technology. We have already consulted with MOTH (Mr. Ludvik Mazuch, co-inventor of the BC STABILIZER technology, MOTH, at Tel: 387-4393) on this matter. We understand that the potassium-based effluent can be used as the lignosulphonate component of the BC STABILIZER. The market for BC STABILIZER is both domestic and off-shore, e.g., Australia.

We would not operate the flax pulp mill if we do not have any external market means for profitable effluent disposal.

As far as the uncontaminated cooling water is concerned, GVRD has now informed us that this water should be directed to the storm sewer.

I hope that the above replies have answered your queries fully.

Regards

Copy: Mr. D. Parsons/ MPRP

ARBOKEM INC.
Suite 101, 358 East Kent Ave. South, Vancouver, B.C. V5X 4W6 Canada
Tel.: (604) 321-9331 Fax: (604) 321-3043

AK7268

To: Mrs. Cristina Jacob
Review Coordinator
GVRD Burnaby FAX: 436-6707

From: Al Wong/ Vancouver

Date: January 14,1991

Re: Arbokem Proposed Flax Pulp Mill

I am writing to you in response to your Mr. Mills' December 6 letter to Mr. D. Parsons (MPRP Coordinator). I have noted your Group's comments. Here are my replies to your principal queries:

Uncertain "Disposal" of the Liquid Fertilizer Co-Product

As you may know,our patented technology is based on the novel economical disposal of the potassium-based effluent. Liquor burning or bio-treatment of the pulping/bleaching effluent would be contrary to the principal claim of our patented process. Such conventional practices would certainly eliminate any future marketing opportunities for our patented process technology in Canada and abroad.

Therefore, we are committed to realize the market for the effluent as a value-added fertilizer and/or as a component of the MOTH-patented BC STABILIZER road stabilization technology. We have already consulted with MOTH (Mr. Ludvik Mazuch, co-inventor of the BC STABILIZER technology, MOTH, at Tel: 1-387-4393) on this matter. We understand that the potassium-based effluent can be used as the lignosulphonate component of the BC STABILIZER. The market for BC STABILIZER is both domestic and off-shore, e.g., Australia.

We would not operate the flax pulp mill if we do not have any external market means for profitable effluent (including solid wastes) disposal.

Possible SO_2 Emission
(Pages 1 and 2 of Mr. Yuen's December 11 letter to you)

The proposed flax pulp mill would be operating in the alkaline/ neutral sulphite regime. The typical pulping liquor pH would be 13+ at the start of the cook and 8.6 at the end of the cook (Data from our Cook #B1238). Under these chemical conditions, we would expect the HSO_3^- component in the spent pulping liquor to be extremely low. And consequently,the "free" SO_2 content of the spent liquor would be effectively non-detectable. Please see attached diagram.

Port Alice mill uses an ammonium acid sulphite pulping system (operating pH 1 to 2) with considerable free SO_2 in the raw and spent cooking liquors. We expect our alkaline/neutral system to discharge well below your estimated 2 kg SO_2/tonne level.

For the future marketing of our patented technology, we are committed to realize the "non-detectable" SO_2 level from the digester,washer and evaporator areas.

Flammability of the Liquid Fertilizer
(Page 3 of Mr. Yuen's December 11 letter to you)

Although pulping liquor at >45% total solids content can be burned, combustion is not spontaneous. In fact, the liquor must be first dried to >90% total solids content before the solids can ignite. Liquor drops produced by the liquor spray gun evaporate as they fall in a stream of hot gases. This is the process that takes place inside a typical pulp mill recovery furnace.

Our liquid fertilizer is not flammable. It would contain no volatile readily-combustible hydrocarbons.

I hope that my above replies have fully answered your immediate queries. More technical details on various potential emission sources will of course be provided as required in the normal permitting steps.

Regards

Copy: Mr. D. Parsons/ MPRP

Definition of Terms Commonly Encountered in the Sulphite Pulping Process

breizing is accomplished entirely by mechanical means, (e.g., stone groundwood or groundwood from chips). Pulp yield is about 95 per cent.

(2) *Classification by Nature of Treatment*

A general definition of the process should indicate cooking liquor by name, starting pH of liquor, and digester yield to which wood is cooked, i.e., sodium bisulphite, pH 4.5, 65 per cent yield. Complete definition should also include chemical and liquor-to-wood ratios, and plots of cooking time vs. temperature and pressure.

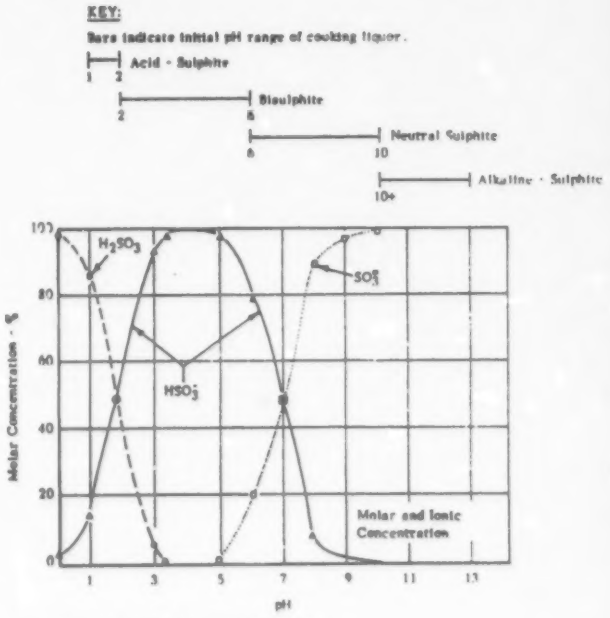
Recommended sulphite nomenclature is based on the relative ion concentration in the cooking liquor (i.e., over 50 per cent HSO_3, the cooking liquor is called X bisulphite, where X is the cation used). The dissociation of sulphurous acid at 25 deg. C. as published by Gmelin (*) has been selected arbitrarily as a reference guide, and the predominant ion concentration has been used in the nomenclature over pH ranges as indicated in Figure 1. Rigorous application of this nomenclature as a function of pH is difficult, however, as there is considerable overlap of pH ranges in common usage. In principle, however, the predominant ion concentration and the initial pH indicates the preferred nomenclature. Nomenclature and process definitions follow:

Item	*Nomenclature*	*Predominant Chemical Agent in Cooking Liquor*	*Approx. Initial pH at 25°C*	*Approx. Final pH at 25°C*
1	Acid Sulphite	$H_2SO_3 + HSO_3$	1-2	1.5-2.5
2	Bisulphite	$X.HSO_3$	2-6	2.5-5.0
3	Neutral sulphite	$X\,SO_3 + XCO_3$ (XOH or none)	6-10	6-9
4	Alkaline sulphite	$X\,SO_3 + XOH$ (or Na_2S)	10 +	9 +

(1) Acid sulphite Process — The process in which the cooking acid used contains a high percentage of free SO_2 (excess SO_2) and therefore has a starting pH as indicated above. The base is usually calcium but may also be a soluble base such as sodium, magnesium, or ammonium.

(2) Bisulphite Process — The process in which the cooking liquor used contains a predominance of bisulphite ion in the 2 to 6 pH range with little or no true free (excess) SO_2. The base must be more soluble than calcium, i.e. sodium, magnesium, or ammonium.

(*) Gmelins Handbuch der Anorganischen Chemie, Schwefel, 9 Teil B2, p. 469, Verlag Chemie, G.M. B H, Weinheim, Germany, 1960.



Dissociation of sulfurous acid at 25°C.

Source: Gmelins Handbuch der Anorganischen Chemie. Schwefel 9. Teil B2 p. 469. Verlag Chemie. GmBH Weinheim. Germany. 1960.

FIGURE 1 SULPHITE NOMENCLATURE

(3) Neutral Sulphite Process — The process in which the cooking liquor used contains a predominance of sulphite ion, in the 6 to 10 pH range. The neutral sulphite semi-chemical (N.S.S.C.) process is one in which wood, usually hardwood, is treated with a cooking liquor made up of a mixture of sodium sulphite and sodium carbonate or other alkali at pH 7 to 9 followed by mechanical fiberizing. Neutral systems are not in common practice for single-stage pulping because of the abnormally long cooking times or high temperatures that would be required to produce fully cooked chemical pulps. However, liquors of this composition are followed by mechanical fibreizing. Neutral systems and in certain single-stage chemi-mechanical pulping systems. Sodium or ammonium base may be used over the entire pH range; magnesium may be used only at the lower pH end due to solubility limitations.

(4) Alkaline-Sulphite — The process in which the cooking liquor used contains sulphite plus alkaline agents at a pH of 10 or higher. This process is likewise not in common usage, except as it pertains to the multistage processes. The base used would be sodium.

Contributed by:
Sulphite Committee

Approved by the Engineering Data Sheet Committee, Technical Section, Canadian Pulp & Paper Association.

Issued: June, 1955
Re-issued: Sept., 1955
Revised: Sept., 1962
Revised: Sept., 1965

ARBOKEM INC.
Suite 101, 358 East Kent Ave. South, Vancouver, B.C. V5X 4W6 Canada
Tel.: (604) 321-9331 Fax: (604) 321-3043

AK7269

To: Mr. Franklin Wiles
Manager, Special Projects
District of Surrey
Surrey FAX: 591-2507

From: Al Wong/ Vancouver

Date: January 14,1991

Re: Arbokem Proposed Flax Pulp Mill

I am writing to you in response to your December 20 letter to Mr. D. Parsons (MPRP Coordinator). I have noted your Group's comments. Here are my replies to your principal queries:

Uncertain "Disposal" of the Liquid Fertilizer Co-Product
(Page 1 of Mr. Bennett's November 8 letter to you)

As you may know,our patented technology is based on the novel economical disposal of the potassium-based effluent. Liquor burning or bio-treatment of the pulping/bleaching effluent would be contrary to the principal claim of our patented process. Such conventional practices would certainly eliminate any future marketing opportunities for our patented process technology in Canada and abroad.

Therefore, we are committed to realize the market for the effluent as a value-added fertilizer and/or as a component of the MOTH-patented BC STABILIZER road stabilization technology. We have already consulted with MOTH (Mr. Ludvik Mazuch, co-inventor of the BC STABILIZER technology, MOTH, at Tel: 1-387-4393) on this matter. We understand that the potassium-based effluent can be used as the lignosulphonate component of the BC STABILIZER. The market for BC STABILIZER is both domestic and off-shore, e.g., Australia.

Sodium sulphite, instead of potassium sulphite, would be used in such special cases as disruption of potassium sulphite supply. In this situation, sodium sulphite is used only if the contract lignosulphonate market for BC STABILIZER is confirmed for the particular operating period.

We would not operate the flax pulp mill if we do not have any external market means for profitable effluent (including solid wastes) disposal.

Fire Protection
(Page 2 of Mr. Bennett's November 8 letter to you and Mr. Seter's December 18 letter to you)

We recognize the fire hazard of handling any dry agricultural residues such as flax fibre. We certainly intend to design our factory for meeting your Municipality's Fire Regulations and Insurance Company's requirements.

Evaporator Cleaning Chemicals
(Page 2 of Mr. Bennett's November 8 letter to you)

Commercial phosphate- or amine-based chemicals would be used in the cleaning of the liquor evaporator periodically. The discharge of these chemicals would be directed to the liquid fertilizer co-product. These chemicals are compatible with potassium-based chemicals.

Similar Plant Elsewhere
(Page 3 of Mr. Bennett's November 8 letter to you)

Unforunately, no other plant of the proposed type is in operation anywhere else in the World. Our technology is novel. Our Canadian patent was only issued in June, 1989. From basic chemical engineering principles, we expect our new-technology flax pulp mill to operate without difficulties, in meeting the most stringent environmental protection regulations in an urban setting.

I hope that my above replies have fully answered your immediate queries. More technical details on various potential emission sources will of course be provided as required in the normal permitting steps.

Regards

Copy: Mr. D. Parsons/ MPRP

ARBOKEM INC.
Suite 101, 358 East Kent Ave. South, Vancouver, B.C. V5X 4W6 Canada
Tel.: (604) 321-9331 Fax: (604) 321-3043

AK7270

To: Mr. A.C. Duncan
Coordinator, Referral and Liaison
Environment Canada
North Vancouver

From: Al Wong/ Vancouver

Date: January 14,1991

Re: Arbokem Proposed Flax Pulp Mill

I am writing to you in response to your December 20 letter to Mr. D. Parsons (MPRP Coordinator). I have noted your comments. Here are my replies to your principal queries:

Process Chemistry

In the proposed flax pulp mill, we would be using potassium sulphite pulping system in the alkaline/neutral regime. The starting pH of the cooking liquor is 13+ and the spent pulping liquor is >8.5. Because of the nature of the cooking liquor, there is virtually no free SO_2 in the entire pulping liquor system. Thus,the emission of any fugitive SO_2 is virtually non-existent. Please see attached data sheet.

Moreover, the raw pulping liquor is made from purchased potassium sulphite granules and liquid potassium hydroxide. There is no burning of sulphur to make SO_2 in the preparation of cooking liquor. Typically,the charge of cooking chemicals is K_2SO_3 (as K_2O) 186 kg/b.d. tonne flax fibre, and KOH (as K_2O) 18.2 kg/b.d. tonne flax fibre.

The fertilizer co-product contains effectively all the potassium and sulphur inputs from pulping and bleaching operations. We do not plan to have any direct discharge of process effluent to our in-plant bio-treatment system. The in-plant bio-treatment is intended mainly for the processing of evaporator condensates, so that the "cleaned" condensate can be re-used in the pulp mill. Our processing scheme is novel. Our Canadian patent was issued only in mid-1989.

Expected Emissions

At the end of the cooking cycle, the digester would be cooled and quenched before the content is discharged for defibration and cleaning. Any accidental vent gases are captured for scrubbing through KOH liquid.

For reasons of process chemistry as given above, our alkaline/neutral sulphite system would have effectively no emission of fugitive SO_2.

GVRD has guessed the SO_2 emission from our proposed pulp mill to be less than 2 kg/b.d. tonne of flax pulp produced. We believe that our actual SO_2 emission would be much lower because the alkalinity of our pulping liquor would be significantly higher than that in conventional NSSC pulping liquor.

Fertilizer Co-Product

Our patented potassium technology is based on the novel economical disposal of the potassium-based effluent. Liquor burning or bio-treatment of the pulping/bleaching effluent would be contrary to the principal claim of our patented process. Such conventional practices would certainly eliminate any future marketing opportunities for our patented process technology in Canada and abroad.

Therefore, we are committed to realize the market for the effluent as a value-added fertilizer and/or as a component of the MOTH-patented BC STABILIZER road stabilization technology. We have already consulted with MOTH (Mr. Ludvik Mazuch, co-inventor of the BC STABILIZER technology, MOTH, at Tel: 1-387-4393) on this matter. We understand that the potassium-based effluent can be used as the lignosulphonate component of the BC STABILIZER. The market for BC STABILIZER is both domestic and off-shore, e.g., Australia.

We would not operate the flax pulp mill if we do not have any external market means for profitable effluent (including solid wastes) disposal.

I hope that my above replies have fully answered your immediate queries.

Regards

Copy: Mr. D. Parsons/ MPRP

Definition of Terms Commonly Encountered in the Sulphite Pulping Process

DATA SHEET
C-00

breizing is accomplished entirely by mechanical means, (e.g., stone groundwood or groundwood from chips). Pulp yield is about 95 per cent.

(2) *Classification by Nature of Treatment*

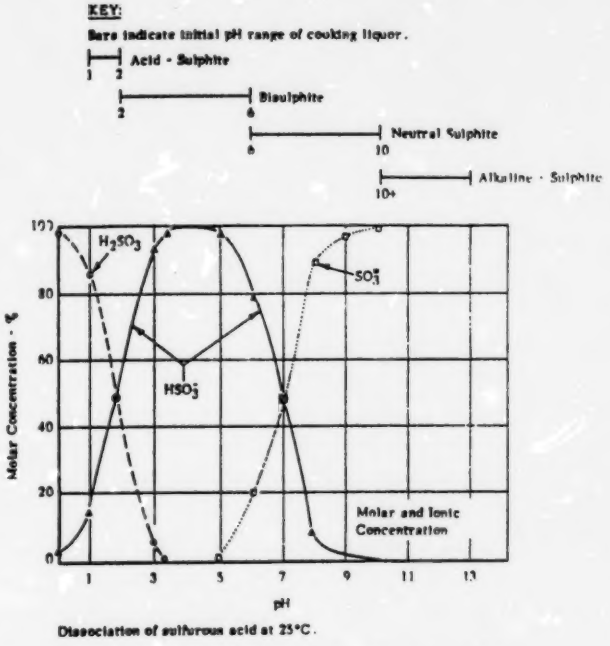
A general definition of the process should indicate cooking liquor by name, starting pH of liquor, and digester yield to which wood is cooked, i.e., sodium bisulphite, pH 4.5, 65 per cent yield. Complete definition should also include chemical and liquor-to-wood ratios, and plots of cooking time vs. temperature and pressure.

Recommended sulphite nomenclature is based on the relative ion concentration in the cooking liquor (i.e., over 50 per cent HSO_3, the cooking liquor is called X bisulphite, where X is the cation used). The dissociation of sulphurous acid at 25 deg. C. as published by Gmelin (*) has been selected arbitrarily as a reference guide, and the predominant ion concentration has been used in the nomenclature over pH ranges as indicated in Figure 1. Rigorous application of this nomenclature as a function of pH is difficult, however, as there is considerable overlap of pH ranges in common usage. In principle, however, the predominant ion concentration and the initial pH indicates the preferred nomenclature. Nomenclature and process definitions follow:

Item	*Nomenclature*	*Predominant Chemical Agent in Cooking Liquor*	*Approx. Initial pH at 25°C*	*Approx. Final pH at 25°C*
1	Acid Sulphite	$H_2SO_3 + HSO_3$	1-2	1.5-2.5
2	Bisulphite	$X.HSO_3$	2-6	2.5-5.0
3	Neutral sulphite	$X\,SO_3 + XCO_3$ (XOH or none)	6-10	6-9
4	Alkaline sulphite	$X\,SO_3 + XOH$ (or Na_2S)	10 +	9 +

(1) Acid sulphite Process — The process in which the cooking acid used contains a high percentage of free SO_2 (excess SO_2) and therefore has a starting pH as indicated above. The base is usually calcium but may also be a soluble base such as sodium, magnesium, or ammonium.

(2) Bisulphite Process — The process in which the cooking liquor used contains a predominance of bisulphite ion in the 2 to 6 pH range with little or no true free (excess) SO_2. The base must be more soluble than calcium, i.e. sodium, magnesium, or ammonium.



Dissociation of sulfurous acid at 25°C.

Source: Gmelins Handbuch der Anorganischen Chemie. Schwefel 9. Teil B2 p. 469. Verlag Chemie. GmBH Weinheim. Germany. 1960.

FIGURE 1 SULPHITE NOMENCLATURE

(3) Neutral Sulphite Process — The process in which the cooking liquor used contains a predominance of sulphite ion, in the 6 to 10 pH range. The neutral sulphite semi-chemical (N.S.S.C.) process is one in which wood, usually hardwood, is treated with a cooking liquor made up of a mixture of sodium sulphite and sodium carbonate or other alkali at pH 7 to 9 followed by mechanical fiberizing. Neutral systems are not in common practice for single-stage pulping because of the abnormally long cooking times or high temperatures that would be required to produce fully cooked chemical pulps. However, liquors of this composition are followed by mechanical fibreizing. Neutral systems and in certain single-stage chemi-mechanical pulping systems. Sodium or ammonium base may be used over the entire pH range; magnesium may be used only at the lower pH end due to solubility limitations.

(4) Alkaline-Sulphite — The process in which the cooking liquor used contains sulphite plus alkaline agents at a pH of 10 or higher. This process is likewise not in common usage, except as it pertains to the multistage processes. The base used would be sodium.

(*) Gmelins Handbuch der Anorganischen Chemie, Schwefel, 9 Teil B2, p. 469, Verlag Chemie, G.M. B H, Weinheim, Germany, 1960.

Contributed by:
Sulphite Committee

Approved by the Engineering Data Sheet Committee, Technical Section, Canadian Pulp & Paper Association.

Issued: June, 1955
Re-issued: Sept., 1955
Revised: Sept., 1962
Revised: Sept., 1965

TOTAL FAX PAGES _____

ARBOKEM INC.
SUITE 101, 358 EAST KENT AVENUE
VANCOUVER V5X 4W6, CANADA
TELEPHONE: 1-604-321-9331 FAX: 1-604-321-3043

AK7168

BRITISH COLUMBIA
ENVIRONMENT
DEC 11 1990
ENVIRONMENTAL IMPACT
ASSESSMENT BRANCH
VICTORIA, B.C.

To: Mr. Francis Yuen
GVRD Burnaby

From: Al Wong/ Vancouver

Date: December 6,1990

Re: Proposed Flax Pulp Mill Project

1. Further to your recent query about the possibility of sulphurous air emission from the proposed flax pulp mill, I have prepared some information for your perusal.

   Copies of the relevant documents are:

   a) Case, J.P., ed., "Pulp and Paper - Chemistry and Chemical Technology", 3rd Ed., Vol. I, Wiley, New York, 1980. pp. 349-351 and pp. 470-473.

   b) Fengel,D. and Wegener,G., "Wood - Chemistry, Ultrastructure, Reactions", Walter de Gruyter, Berlin, 1984. pp.452-453.

   c) Ingruber, O.V., Kocurek, M.J., and Wong, A., eds., "Sulfite Science and Technology", Vol. 4, 3rd Ed., Pulp and Paper Manufacture, published by the Joint Textbook Committee of the Paper Industry, CPPA and TAPPI, Montreal, 1985. pp.32-33.

2. As you know, our proposed flax pulp mill would be using a patented potassium alkaline sulphite process. It is **not** a kraft process.

   >>> During kraft cooking, lignin reacts with "sulphur in the form of **SULPHIDE**" to form odoriferous CH_3SH and $(CH_3)_2S$.

   >>> During sulphite cooking, lignin reacts with "sulphur in the form of **SULPHITE**" to form non-volatile soluble sulphonated lignin.

4. If you have any queries regarding this matter, please do not hesitate to me or our Dr. Jiri Tichy (Manager, Process Technology).

Regards

Copy: D. Parsons/ MPRP
F. Wiles/ Surrey

PULP AND PAPER
Chemistry and Chemical Technology
Third Edition-Revised and Enlarged

Volumes in preparation–

II FIBER PREPARATION AND APPROACH FLOW
FIBER BONDING
SHEET FORMATION AND DRYING
NONWOVENS AND PAPERS FROM SPECIAL FIBERS
SYNTHETIC PAPERS AND PULPS
ENVIRONMENTAL CONTROL
MICROBIOLOGY

III DRY STRENGTH RESINS
NATURAL PRODUCTS FOR WET-END ADDITION
FILLING AND LOADING
INTERNAL SIZING
RETENTION CHEMISTRY
WET STRENGTH
DYEING OF PAPER
SURFACE SIZING
PROPERTIES OF PAPER

IV PIGMENT COATING
PRINTING
REPROGRAPHY
LAMINATING
CORRUGATING
PAPER REINFORCEMENT BY POLYMER ADDITION
PAPER LAMINATES
AQUEOUS AND SOLVENT COATINGS
EXTRUSION AND HOT MELT COATINGS

PULP AND PAPER
Chemistry and Chemical Technology
Third Edition, Volume I

JAMES P. CASEY
Editor

ARBOKEM INC.

A WILEY-INTERSCIENCE PUBLICATION
JOHN WILEY & SONS 1980
New York • Chichester • Brisbane • Toronto • Singapore

bleached yields in the range of 45 to 50% are usually obtained for bleachable grades, whereas values of 48 to 53% are obtained with bisulfite pulping. Further shrinkage in yield of several percentage points occurs during the bleaching. High-yield pulps for newsprint are normally produced in the range of 65 to 75% yield.

Chemical Reactions in the Sulfite Process

The reactions that take place during sulfite pulping are: (1) the reactions in connection with delignification, (2) reactions with the carbohydrates in the wood, and (3) a variety of miscellaneous reactions. These are now discussed.

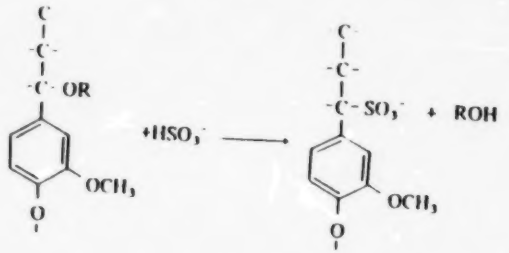
Lignin Sulfonation and Dissolution

The early work on the mechanism of sulfite pulping has been thoroughly reviewed by Hagglund[405]. It was shown that, stoichiometrically, in the sulfonation reaction, the elements of bisulfite are added to the lignin molecule. Klason suggested that sulfonation consists of an addition of bisulfite to ethylenic double-bond units, but since such units have never been found to exist in lignin, this does not appear to be the mechanism. Freudenberg[406] postulated a two-step process in which first an oxygen linkage between two carbon atoms in the lignin molecule was ruptured to produce a phenolic and an aliphatic hydroxyl group, and then the latter was replaced by a sulfonic acid group. This mechanism was found to be inconsistent with the chemical reactions of methylated lignin, which can be sulfonated but not dissolved.[407] Hagglund found that partial sulfonation of the lignin in wood occurred readily in neutral or weakly alkaline solutions, but that these sulfonated lignins were not soluble in the cooking liquor. Erdtmann[408] showed that dissolution occurred only when the sulfur content of the lignin reached a value corresponding to about one sulfonic acid group per two methoxyl groups, the level usually found in technical sulfite lignosulfonic acids.[409] Brauns[410] had shown earlier that in order to dissolve lignin with sulfite solutions, the sulfur content of the lignin had to be at least 3.5%, equivalent to one sulfonic acid group per lignin unit of molecular weight 840. Earlier, Hagglund[411] had found that if a sulfite cook was interrupted while the pulp still contained a considerable proportion of lignin, the sulfonated lignin could be dissolved by heating with acidic solutions containing no sulfite. It was postulated that lignin dissolution occurred in two stages: sulfonation of the lignin followed by an acid-catalyzed hydrolysis of a covalent linkage. The latter was viewed as the rate-determining step. Since the same reactions occurred with hydrochloric acid lignin, which contains very little carbohydrate, it was concluded that the hydrolysis involved lignin-lignin bonds rather than a lignin-carbohydrate linkage.[412] On the other hand, based on the kinetics of the sulfite process, Maass and his associates[182] concluded that the rate of sulfonation was the rate governing step in sulfite pulping. More recently it has been established[413] that both sulfonation and hydrolysis are probably involved

ARBOKEM INC.

in the reaction, either one can govern the reaction, depending on sulfur dioxide content and pH of the pulping liquor. It was shown by Rydholm[414] that, in the presence of sulfite cooking liquor, sulfitolysis occurred more rapidly than hydrolysis and was the more likely second step. On the other hand, if the correct mechanism involved hydrolysis in the second step, a further sulfonation would be necessary to reach the methoxyl-sulfur ratio observed in lignosulfonic acids from technical cooks. The two mechanisms shown in Figure 4-11 were considered by Rydholm as being possible routes to the sulfite dissolution of lignin. The information available does not clearly differentiate between the two mechanisms, but kinetic and analytical data on technical sulfite cooking indicate that sulfitolysis plays at least some role in delignification.

Considerable work has been done using structural models of lignin functional groupings to determine the nature of the reactions of lignin in the sulfite process. Lignin is made up of substituted phenyl propane units and it is evident that the initial reaction takes place at the α-carbon atom of this structure, which is activated by the phenolic grouping in the adjacent benzene ring.



The R group in the structure can be hydrogen (benzyl alcohol), carbohydrate, or another lignin unit (benzyl ethers). Treatment of a wide number of model compounds of this type has indicated that, in all cases, these materials can be sulfonated in the α position.[415–418] Based on studies using many different lignin-model compounds, Gierer[418] has summarized the reactions that occur in the dissolution of lignin in the sulfite process in three general categories:

1. *Sulfonation.* This reaction occurs predominantly, if not exclusively, in the α position by a carbonium ion mechanism. All benzyl alcohol, benzyl alkyl ether, and benzyl aryl ether structures can be sulfonated in the α position under sulfite pulping conditions.
2. *Degradation.* Bonds joining lignin units are mainly of the β-aryl ether type; these are quite stable to acidic sulfite conditions. Thus complete separation of two adjacent lignin units does not often occur. This explains the fact that acid sulfite treatment of lignin does not increase its content of phenolic hydroxyl groups.

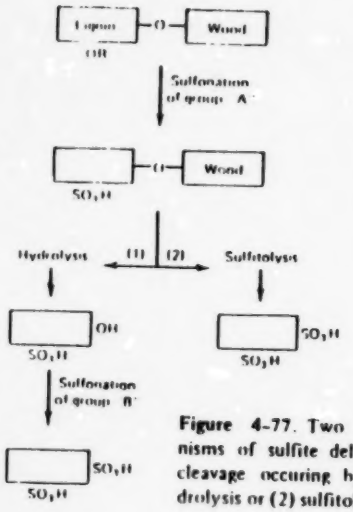


Figure 4-77. Two possible mechanisms of sulfite delignification, with cleavage occuring by either (1) hydrolysis or (2) sulfitolysis.

3. *Condensation.* These reactions compete with the sulfonation reaction for the reactive sites in lignin and counteract any degradation which occurs

Goring[419,420] has studied the nature of successive lignin fractions removed during the course of a sulfite cook, using a continuous flow digester. There was no difference in the methoxyl content, ultraviolet absorption, sulfur content, refractive index increment, infrared spectra, or neutralization equivalents of the lignosulfonates from the different fractions. The average molecular weight, on the other hand, increased from 10,000 for the first fraction to 140,000 for the final fraction in the case of acid sulfite pulping, and from 10,000 to 77,000 for bisulfite pulping. Some of the values obtained for the bisulfite cooking series are shown in Table 4-26. Since recooking of the fractions with sulfite liquor did not produce any substantial increase in molecular weight, it was concluded that the increasing molecular weight of the successive lignin fractions was not due to condensation of lignin as the cook proceeds. The results appear to support a concept of pulping in which a three-dimensional network of phenyl-propane-type monomer units, having various reactive sites, is simultaneously sulfonated and degraded. The low-molecular-weight fragments become soluble first, while the larger fragments are released only as the slower degradation reaction proceeds to a sufficient extent to permit their solubility.

The topochemical aspects of lignin removal at the fiber level have been studied using the ultraviolet microscope. In an early study Lange[421] reported

ARBOKEM INC.

TABLE 4-26 PROPERTIES OF SUCCESSIVE FRACTIONS OF LIGNOSULFONIC ACID REMOVED DURING A SULFITE COOK[a]

Fraction	Sulfur (%)	Methoxyl (%)	UV Absorption at 280 nm[a] (cm^{-1}/g^{-1})	Refractive Index[a] ($ml.g^{-1}$)	Weight Average Molecular Weight
1	6.2	11.8	13.3	0.155	10,000
2	5.6	12.8	12.1	0.181	13,600
3	5.2	12.9	12.8	0.191	31,000
4	5.5	12.6	14.1	0.198	77,000

[a] Values obtained after separation of carbohydrate material by electrophoresis-convection.

consumption in the kiln is 8 to 10 × 10^6 kJ/ton (7 to 9 × 10^6 Btu/ton) of lime. The gases leaving the kiln are normally passed through a scrubber to remove entrained lime dust.[897] In the fluidized-bed calciner,[898] the wet mud is mixed with hot flue gas in a cage mill where it is dried and disintegrated to a fine powder. This material is then separated from the gas in a cyclone and fed to the calciner, which is a two compartment unit. Dried mud and fuel are fed to the upper bed where calcination of the carbonate takes place at about 900°C. The fine particles agglomerate to pellets ranging from 6 to 65 mesh in size. The pellets formed in excess of those required to maintain the upper bed at the desired level are removed to the lower bed, where they are cooled by the incoming combustion air. The pellet size is controlled in the desired range by maintaining the residual sodium content of the feed in the range of 0.2 to 0.4% on a dry basis.[896] The fluid-bed calciner offers the advantage of reduced emissions, low fuel requirement, high quality product, low maintenance, high flexibility, and minimum space requirement. However, the system is more costly to install and its operation requires more electrical power to operate than a conventional rotary kiln.

It is important in the operation of a causticizing system that lime of high quality be produced for the subsequent slaking and causticizing stages, and this quality is largely determined by the operating conditions in the lime reburning system. The degree of burning can be determined by measuring the CO_2 generated on acidification of the product.[899] Lime with optimum properties for causticizing is obtained when the product from the kiln is not completely burned, but still contains a small amount of residual calcium carbonate. The optimum residual calcium carbonate level varies with the particular conditions for individual systems, but should normally be less than 5%.[899,900] Calcining to an excessive extent produces lime with poor settling characteristics.[900,901] Furthermore, too rapid a rise to temperature as well as excessive temperature and time during burning produce lime with low porosity and reduced reactivity in the slaking process.[902,903]

Kraft Odor Emissions

The public concern over the obnoxious odors produced during kraft pulping has grown considerably. Although progress has been made in reducing this problem, the goal of the completely odor-free kraft mill has not become a reality. Several reviews and bibliographies on the subject have been published.[904-907] They outline both the nature and the scope of the problem and review the steps that have been taken to alleviate it.

Sources and Causes of Kraft Mill Odors

The main four constituents of kraft mill emissions that contribute to odor emission are hydrogen sulfide (H_2S), methyl mercaptan (CH_3SH), dimethyl sulfide (CH_3SCH_3), and dimethyl disulfide (CH_3SSCH_3). Of these, hydrogen sulfide and methyl mercaptan are usually present in the highest proportions.

The odor thresholds of both hydrogen sulfide and methyl mercaptan are extremely low, on the order of one part per billion.[908,909] Obviously, it would be very difficult to operate a kraft mill under such close control that its gaseous emissions never exceeded this level. Nevertheless, steps can be taken in the mill to reduce the amount of these materials produced and to eliminate them as much as possible from the discharge streams. Although kraft mill emissions cause unpleasant odors, they do not have other harmful effects at the concentration levels encountered in the atmosphere in and around mills. Hydrogen sulfide is lethal at high concentrations, but neither it nor methyl mercaptan have any known deleterious effect on either animal or plant life in the parts-per-billion concentration range.

Hydrogen sulfide is always present to some extent in the gas phase over sulfide solutions, the concentration is governed by the following equilibrium:

$$H_2S(g) \rightleftharpoons H_2S\ (\text{solution}) \rightleftharpoons HS^- + H^+ \rightleftharpoons S^= + 2H^+$$

This relationship predicts that the concentration of hydrogen sulfide in the gas phase over sulfide solutions will increase appreciably as the pH decreases.[910] The empirical data for H_2S vapor pressures over 0.01M sulfide solutions shown in Figure 4-110[904] illustrates this relationship. This figure also shows the effect

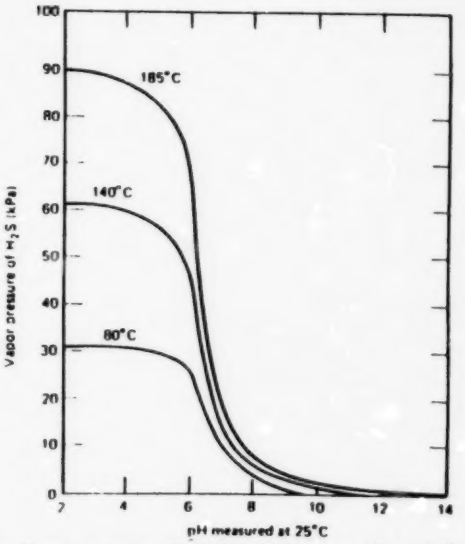


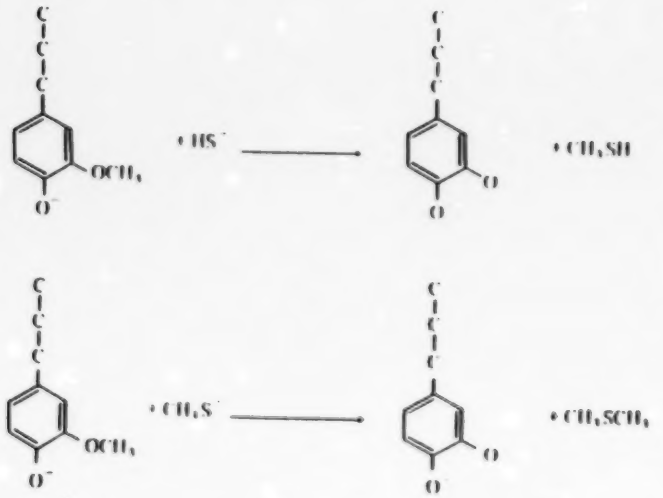
Figure 4-110. Vapor pressure of 0.01M H_2S versus pH at 25°C at various temperatures

ARBOKEM INC.

of temperature, which, although not as great as that of pH, still has a significant influence on the hydrogen sulfide vapor pressure. Although these data suggest that hydrogen sulfide vapor pressures are very low in the range of 11 to 12 pH which is usually encountered in spent liquor, these very low vapor pressures are still significant from an odor standpoint at the higher concentrations of sulfide used in alkaline pulping.

Methyl mercaptan also dissociates in alkaline solution and consequently its volatility also decreases with increasing pH. It is a much weaker acid than hydrogen sulfide, however, and thus retains much higher vapor pressures at elevated pH levels. The effect of pH and temperature on the vapor pressure of methyl mercaptan is shown in Figure 4-111.[904] In the range of 10 to 12 pH encountered in black liquor systems, there is a substantial vapor pressure of methyl mercaptan, particularly in the higher temperature range. As a result, significant quantities of methyl mercaptan can be lost to the atmosphere even at very high pH levels. Methyl sulfide and dimethyl sulfide do not form sodium salts; their volatilities are therefore not dependent on the pH.

Methyl mercaptan and dimethyl sulfide are formed during pulping as a result of bimolecular nucleophilic substitution reactions with the methoxyl groups of lignin as shown below.[911]



The rates of these reactions are dependent on the concentration of the hydrosulfide ion;[912] at increasing sulfidities, increased amounts of methyl mercaptan and dimethyl sulfide are formed. For softwoods, the combined yield of these two products increases in an essentially linear manner with time. The mercaptan

ARBOKEM INC.

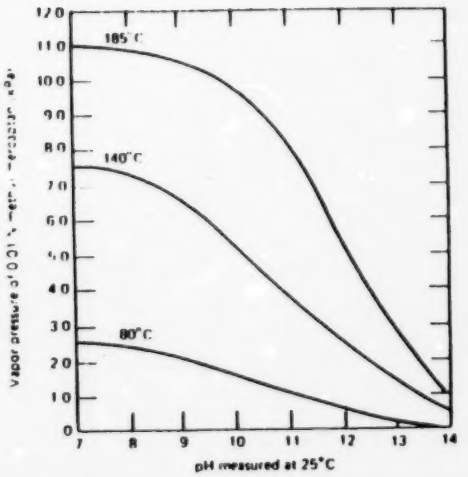


Figure 4-111. Vapor pressure over a 0.01N solution of methyl mercaptan as a function of pH at different temperatures.

forms more rapidly at first; dimethyl sulfide only begins to form when the mercaptan concentration reaches a significant level. Even at the end of the cook, the concentration of mercaptan is substantially higher than that of dimethyl sulfide. Hardwoods generate both methyl mercaptan and dimethyl sulfide at a more rapid rate than softwoods, consequently the odor level is particularly high when hardwood is used in the kraft process.[913] The activation energy for formation of methyl mercaptan and dimethyl sulfide is 22.5 and 19.0 kcal/mole respectively.[912] Since this is substantially less than that of kraft delignification (32 kcal/mole), an increase in cooking temperature will decrease the amount of these two contaminants formed at a constant level of delignification.

Dimethyl disulfide is the least odorous and the least volatile of these four odorous materials. It is formed in side reactions by oxidation of methyl mercaptan:

$$4CH_3SH + O_2 \rightarrow 2CH_3S\text{-}S\text{-}CH_3 + 2H_2O$$

Even though precautions are taken to keep the concentration of these four contaminants as low as possible, they are always present to some extent in spent liquors. A considerable portion of the sulfide charged at the beginning of the cook remains in the spent liquor, and becomes a potential source of hydrogen sulfide emission. Formation of methyl mercaptan and dimethyl

Dietrich Fengel
Gerd Wegener

Wood

Chemistry, Ultrastructure, Reactions

ARBOKEM INC.

Walter de Gruyter
Berlin · New York 1984

with a refining step in between. The first one is a high-yield soda-AQ cook down to kappa numbers of 50–60. The second delignification step is performed as a medium- to-high consistency (> 10%) hydrogen peroxide bleaching (less than 0.5% H_2O_2 based on wood), reducing the kappa number down to about 30. The obvious advantages of this process are:

- 2–5% higher yields than in kraft pulping
- better mechanical characteristics and higher brightness as compared to kraft and soda-AQ pulps
- low AQ amounts (less than 0.1%)
- elimination of the air pollution problems of kraft pulping
- easy and low-cost substitution within existing kraft mills by installation of a refiner section and a hydrogen peroxide bleaching tower

16.5. Sulfite Chemical Pulping

16.5.1. The Sulfite Systems

From a chemical standpoint sulfite pulping liquors vary with respect to the possible forms of sulfur dioxide in aqueous solution and the type of base added to this system. The reaction of sulfur dioxide with water principally yields:

- dissolved SO_2 and/or sulfurous acid (H_2SO_3)
- bisulfite (hydrogen sulfite) (HSO_3^-)
- monosulfite (SO_3^{2-}),

according to the equilibrium sequence

$$SO_2 \rightleftharpoons SO_2 \text{ (dissolved)} \overset{H_2O}{\rightleftharpoons} H_2SO_3 \rightleftharpoons H^+ + HSO_3^- \rightleftharpoons H^+ + SO_3^{2-}$$

In sulfite pulping the composition of the cooking liquor is characterized by the terms free, combined and total sulfur dioxide, expressed as g SO_2/100 ml of liquor (Tappi Standard T pm-79). The liquor is described more precisely by the actual content of sulfurous acid, bisulfite and monosulfite, derivable from the above-mentioned SO_2-values.

In the presence of alkali (e.g. sodium hydroxide) bisulfite and monosulfite are formed from the dissolved SO_2:

$$H_2O + SO_2 \rightleftharpoons H_2SO_3 \text{ (or } SO_2 \cdot H_2O)$$
$$H_2SO_3 + NaOH \rightleftharpoons NaHSO_3 + H_2O$$
$$NaHSO_3 + NaOH \rightleftharpoons Na_2SO_3 + H_2O$$

The resulting pH level of the liquor depends on the concentrations of sulfurous acid, monosulfite and bisulfite. Fig. 16-15 demonstrates the pH range of sulfite systems (1.5–9), revealing the inflection points of bisulfite at about pH 4.5 and of

ARBOKEM INC.

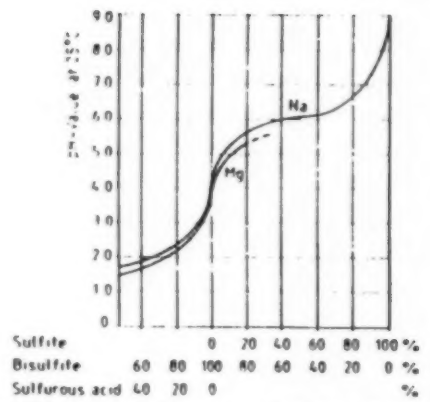


Fig. 16-15. The different composition of sulfite solutions, depending on the pH level (Bryce 1980b)

monosulfite at about pH 9. The real pH levels in sulfite pulping, applying temperatures up to 180 °C, are somewhat different, as the pH values generally increase with increasing temperatures (Schöön, Wannholt 1969).

The pH values are additionally influenced by the type of base used in the cooking liquor. The following bases are normally used in sulfite pulping: calcium, magnesium, sodium and ammonia. Calcium is the classical base in acidic sulfite pulping involving both advantages and severe disadvantages. The advantages are the low price and the good availability of limestone as the dominant raw material. The drawbacks are the limited solubility of calcium sulfite, scaling problems and the lack of a suitable recovery system. The low solubility of calcium sulfite at elevated temperatures requires an excess of free SO_2 to keep the pH value below 3, preventing the formation of calcium sulfite from calcium hydrogen sulfite.

A much better solubility is obtained with magnesium as a base, covering the pH range up to about 5. The outstanding advantage of magnesium-based sulfite pulping is the possibility of combusting the waste liquor to yield magnesium oxide and sulfur dioxide for producing fresh cooking liquor.

As sodium sulfite and sodium bisulfite are soluble under conditions applied in sulfite pulping, sodium is a highly attractive base. Furthermore it is quite easy to prepare the pulping liquors, usually by starting with sodium hydroxide in solution or less frequently with solid sodium carbonate. The sodium recovery was a drawback of this base as compared to magnesium, but there are several commercial recovery systems available today (Wong 1980, 1981).

Ammonia, the other monovalent base, is comparable to sodium with regard to the solubility of the sulfites, but the handling of the aqueous ammonia solutions and the

PULP AND PAPER MANUFACTURE

THIRD EDITION

VOLUME 4

SULFITE SCIENCE & TECHNOLOGY

Edited by

Dr. Otto V. Ingruber, *Consultant*
Retired Senior Research Associate
CIP Research Ltd., Hawkesbury, Ontario, Canada

Dr. Michael J. Kocurek, *Professor and Chairman*
Department of Paper Science & Engineering
University of Wisconsin at Stevens Point, U.S.A.

and

Al Wong, *P.E., Specialist Technology Management*
Arbokem, Inc., Montreal, Quebec, Canada

ARBOKEM INC.

Prepared under the direction of and published by

THE JOINT TEXTBOOK COMMITTEE OF THE PAPER INDUSTRY

TAPPI
Technology Park/Atlanta
P.O. Box 105113
Atlanta, Georgia U.S.A. 30348-5113

CPPA
Sun Life Bldg., 23rd Floor
1155 Metcalfe Street
Montreal, Que. Canada H3B 2X9

1985

ARBOKEM INC.

as shown. These units are linked together in many different ways, predominantly by oxygen (ether) bridges connecting the alpha or beta carbons of the side chain of one unit with the phenyl ring of the other.

A description of the reactions of lignin in the various sulfite processes from acid to alkaline has been published recently [18]. It has been found that, in spruce and birch, one half of the structures combining two phenyl propane units are of the beta-phenolic ether type shown in Fig. 36, and must therefore play a major role in the process of sulfonation and fragmentation of the lignin macro molecule. Using this example, a simplified model of the reactions in a neutral sulfite cook is given in Fig. 36.

At any pH level used in sulfite pulping the alpha-carbon position in the phenyl propane unit is the most active site for reaction with the negatively charged ions used in conventional pulping processes, such as hydroxide, bisulfide, bisulfite and sulfite, as well as aqueous sulfur dioxide. In native lignin, only a few sites are ready for reaction with these pulping reagents but reactive alpha-sites are caused by transformation of the phenolic structure into quinone methide structures. The beta-carbon position is less active and frequently engaged in beta-phenolic ether linkages, but can be sulfonated in neutral and weakly alkaline media after cleavage of the oxygen link (sulfitolysis), induced and accelerated by sulfonation in the adjacent alpha-carbon position. Thus, in this case, two kinds of phenyl propane sulfonic acids result, one sulfonated in both the alpha and beta carbon positions, the other only in the alpha position.

Under acid bisulfite conditions the alpha-carbon site assumes the nature of a positively charged ion and immediately reacts with the negative bisulfite ion in solution, resulting in extensive sulfonation. Sulfonic acid groups are also introduced into the side chains of oxidized lignin structures while degradation is restricted to the cleavage of oxygen (ether) linkages. On the other hand, condensation reactions between phenyl propane structures also occur in the acid environment.

Condensation results in the formation of carbon-carbon linkages between lignin structures. These linkages are resistant to acid hydrolysis, inhibiting the progress of lignin depolymerization to smaller, soluble compounds. It is also for reasons of formation of condensation products with lignin that resinous woods, such as pines, with a high content of non-lignin phenolic substances resist pulping by the acid bisulfite process.

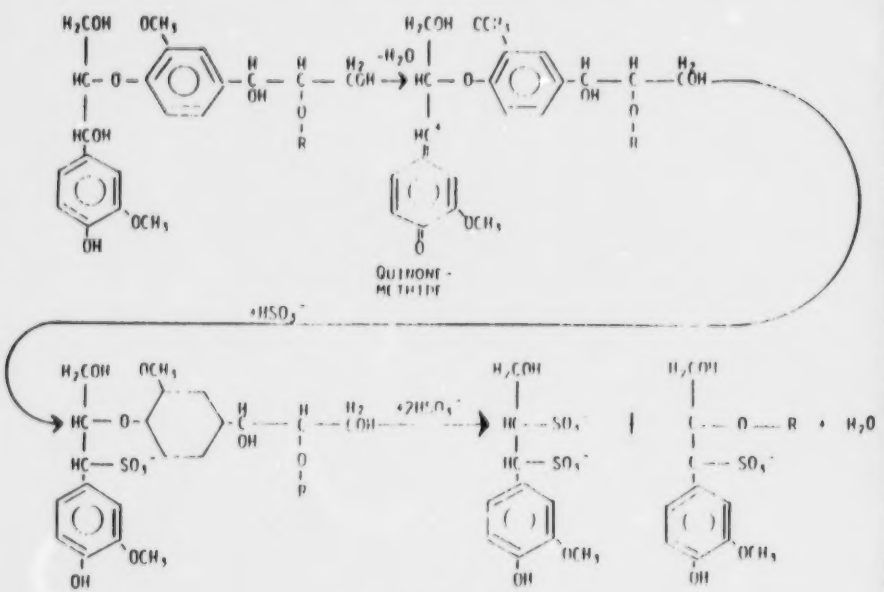


Fig. 36. Model of lignin sulfonation and degradation in "neutral" sulfite pulping

In bisulfite pulping, lignin sulfonation and dissolution has not been studied. The process uses sodium or magnesium base cooking liquors and serves predominantly for manufacturing high yield chemimechanical pulps from soft wood for use as the long-fiber component of publication papers. The emphasis is therefore on sufficient sulfonation, as measured by sulfur content of the pulp, for the purpose of making the lignin binder soft and hydrophilic rather than to dissolve the lignin, and thereby to facilitate the liberation of the fibers and to increase their bonding strength. It is known that at pH 4 the phenyl propane-beta-phenolic ether structure is easily sulfonated at the alpha-carbon. Dissolution of the lignin is, however, much slower than in acid bisulfite pulping, but more rapid than in "neutral" sulfite pulping.

Interest in the low-odor alkaline sulfite pulping process in the pH range 10-13.5 has been increasing considerably in recent years, since it is capable of producing very strong chemical pulps which are more easily bleached than kraft pulps. Results of definitive studies of the chemical mechanisms involved have not come forth at this time. From the point of view of our knowledge of the chemistry of the sulfite process and of the alkaline processes, kraft and soda, the new sulfite process appears to be attractive. (A concise summary of the delignification mechanics in common alkaline systems is found in Casey, 3d Edition, Vol. 1, p. 69 [47].) Combining the potential of two strong pulping reagents, sulfite ions and hydroxyl ions, lignin bonds should be effectively attacked and secondary condensation reactions of lignin structures should be reduced by sulfonation and hydroxylation of intermediate structures isolated during the cook. Thus alkaline sulfite pulping may offer a combination of the phenol-dissolving and depolymerizing action of soda (NaOH) pulping with the creation of hydrophilic properties of the fiber typical of sulfite pulping.

In its natural state, lignin is insoluble in water and hydrophobic (non wettable). When reacted with sulfite chemicals it is converted to lignosulfonate with radically different properties. With the introduction of sulfonic acid groups into the phenyl propane structure the formerly neutral and ionically inactive compound becomes the second strongest organic acid known with a dissociation constant of $3 \cdot 10^{-2}$, 15 times stronger than a solution of SO_2 in water of $K_a = 10^{-3}$ at room temperature. Sulfonation takes place over the whole pH range but decreases rapidly towards the strongly alkaline range where the activity of the bisulfite ion has stopped and the lesser activity of the sulfite ion is overtaken by the rapid rise of the activity of the hydroxyl ion as delignification agent.

The strong and stable lignosulfonic acid anion $L{-}SO_3^-$ is thus present at many sites throughout the lignin macromolecule due to sulfite pulping treatment and transforms the native lignin into a large multi-branched macro-anion, a schematic model of which is shown in Fig. 37 [19]. (Note that in hardwood bisulfite cooks, up to 30% of the sulfur content of the lignin is not in the form of lignosulfonic acid.)

Viewed from another angle, lignin becomes a strong anionic ion exchange complex with greatly increased hydrophilic (wettable, swellable) properties. This is probably the reason that unbleached sulfite pulps develop good strength with relatively little mechanical energy input.

In high yield pulping, more or less of this sulfonated complex remains in the chip with the fibers until fiberization of the structure by mechanical means. No matter whether in the chip or fragmented with the fibers, it carries an equivalent amount of positive base ion (Na^+, Mg^{++}, Ca^{++}, NH_4^+) to satisfy the electrostatic principle of electroneutrality. When the water is removed from such a structure the positive base ions join the negative macro ion and form lignosulfonate salt.

When cooking pulps of greater purity the same applies as above, except that the original macromolecule is fragmented by chemical action and a large portion of the fragments is reduced to

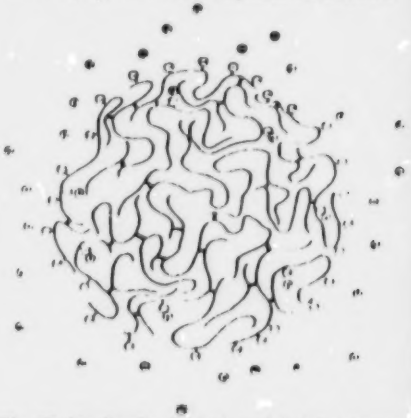


Fig. 37. Idealized spherical model of the spruce lignin sulfonate macromolecule [19]

APPENDIX 5

Arbokem Response to Public Comments

ARBOKEM INC.
Suite 101, 358 East Kent Ave. South, Vancouver, B.C. V5X 4W6 Canada
Tel.: (604) 321-9331 Fax: (604) 321-3043

To: Mike Smith
P.O. Box 511
Lister,B.C. V0B 1Y0

AK7266

From: Al Wong/ Vancouver

Date: January 13,1991

Re: Flax Pulp Mill

In response to your letter dated December 11,I can inform you that we are interested to purchase flax fibre/straw from your Group in the Creston Valley.

I can not take any action until I have received a positive decision from the Major Project Review Process (MPRP) Steering Committee. I have now been informed by MPRP that a decision will be forthcoming before the end of January.

Assuming everything goes well,I would certainly like to come to Cranbrook to meet you and your associates for a discussion of flax fibre/straw purchase. I hope to have a better idea on timing within the next few weeks.

In the meantime,if you have any queries about our project,I would be pleased to answer them. I appreciate your interest in our flax pulp project.

Regards

ARBOKEM INC.
Suite 101, 358 East Kent Ave. South, Vancouver, B.C. V5X 4W6 Canada
Tel.: (604) 321-9331 Fax: (604) 321-3043

To: Mrs. Sherri Demers AK7265
Economic Development Officer
Opportunities North
Fort St. John FAX: 604-785-1125

From: Al Wong/ Vancouver

Date: January 13,1991

Re: Flax Pulp Mill

In response to your letter dated November 29,I can inform you that "everything is movable until construction actually starts".

For your background information,I am enclosing a copy of our Project Prospectus as submitted to the Major Project Review Process (MPRP) Steering Committee in October,1990. I have now been informed by MPRP that a decision will be forthcoming before the end of January.

Even if the decision is "yes" for the Surrey site,we will start expeditiously to search for a new site to construct a second flax pulp mill in Western Canada. For our project planning,I would like to know why your North Peace Group would be interested in establishing a "small-scale flax pulp mill" in your area.

I may be in your area on other business during the next few months. Perhaps I can come to meet with you at that time. In the meantime,if you have any queries about our project,I would be pleased to answer them.

Regards

ARBOKEM INC.
Suite 101, 358 East Kent Ave. South, Vancouver, B.C. V5X 4W6 Canada
Tel.: (604) 321-9331 Fax: (604) 321-3043

December 16,1990 AK7199

Mr. A.G. Thomlinson
Environmental Director
United Fishermen and Allied Workers' Union
160 - 111 Victoria Drive
Vancouver V5L 4C4

Dear Mr. Thomlinson:

Re: Proposed Flax Pulp Mill

This is to acknowledge review of your December 7 letter to Mr. Parsons of the MPRC.

I appreciate your Union's concern about the construction of a "pulp mill" in the lower Fraser River region. I have the following comments for your consideration:

1. New Technology

I would like to assure you that our proposed flax pulp mill is not an ordinary kraft wood pulp mill. In fact,the technology to be used in the proposed flax pulp mill is so different that it is not possible to issue any meaningful standard "Environmental Impact Statement".

2. Site Characteristics

Unlike all other kraft wood pulp mills in North America, our proposed flax pulp mill would have no discharge of pulping or bleaching effluent to the receiving water.

As shown on Page 17 of our Project Prospectus, the only effluent stream from the proposed flax pulp mill would be about 4 cubic metres/day of biologically-treated evaporator condensate, to the GVRD sewer system.

In our opinion, the site characteristics would be little or no consequence on the impact of our proposed flax pulp mill in Port Kells, on the aquatic environment.

3. Spill Contingencies

Because of the small size of our proposed flax pulp mill, there is no urgency to "push pulp production" as in the case of the large kraft wood pulp mill. Our proposed 20 tonnes per day flax pulp mill can be started and stopped easily, similar to a simple pilot plant operation. The spill propensity of our proposed flax pulp mill operation would be largely reduced.

In contrast, the typical world-scale kraft wood pulp mill produces over 1,000 tonnes per day. It is much more difficult to start up and operate such a large pulp mill without liquor and effluent spills.

Nevertheless, we will have adequate provision for spills at our factory site. In order to meet stringent regulatory permit requirements, we will have an approved pro-active spill contingency plan.

4. Product Market Assurance

Because we have spent considerable sum of research money and time to develop this novel technology, it is to our interest that the co-product has an assured acceptable end use. The principal confirmed end uses are a) liquid fertilizer, and b) road stabilizer as per technology which has recently been patented by the B.C. Ministry of Transportation and Highways. In our strategic business plan, we wish to demonstrate our patented technology at the proposed Port Kells mill, for future marketing to others in Canada and abroad.

We have no provision for "sewering" the spent pulping or bleaching effluent. We have no plan to apply for a standard effluent discharge permit. And even if we were allowed mill effluent discharge, potassium chemical would be too expensive to sewer directly. We are confident that we can meet the challenge of developing a truly environment-friendly pulp manufacturing technology.

Please do not hesitate to contact me if you have any other queries regarding our proposed flax pulp mill project.

Yours truly,

Al Wong
President

Copy: Mr. D. Parsons/ MPRC
Mr. F. Wiles/ Surrey Municipality

ARBOKEM INC.
SUITE 101, 358 EAST KENT AVENUE
VANCOUVER V5X 4W6, CANADA
TELEPHONE: 1-604-321-9331 FAX: 1-604-321-3043

December 12,1990 AK7171

Miss Ann Hillyer
Barrister & Solicitor
West Coast Environmental Law Association
1001-207 West Hastings St.
Vancouver V6B 1H7

Dear Miss Hillyer,

Re: Proposed Flax Pulp Mill

This is to acknowledge receipt of your December 6 letter.

I can appreciate your Association's concern about the construction of a "pulp mill" in the Province. I have the following comments for your consideration:

1. Environmental Impact

I would like to assure you that our proposed flax pulp mill is not an ordinary kraft wood pulp mill. In fact,the technology to be used in the proposed flax pulp mill is so different that it is not possible to issue any meaningful standard "Environmental Impact Statement".

Unlike all other kraft wood pulp mill in North America, there would be no burning of the spent pulping liquor and solid wastes at our proposed flax pulp mill. Only the following quantities of pollutants can be estimated:

Hydrogen sulphide*	Zero	milligram/cubic metre of air
Methyl mercaptan*	Zero	milligram/cubic metre of air
Dimethyl sulphide*	Zero	milligram/cubic metre of air
Dimethyl disulphide*	Zero	milligram/cubic metre of air
Sulphur dioxide	Zero	milligram/cubic metre of air
Particulate matter	Zero	milligram/cubic metre of air
Carbon dioxide	Zero	milligram/cubic metre of air

As you may know already, the chemicals marked (*) are the pollutants which are uniquely associated with the malodourous air pollution problems of kraft wood pulp mills in the Province.

Similarly,as shown on Page 17 of our Project Prospectus, the expected level of water-borne pollutants is so low that a standard "Environmental Impact Statement" has no real meaning.

Start-up/ Shutdown

Because of the small size of our proposed flax pulp mill, there is no urgency to "push pulp production" as in the case of the large kraft wood pulp mill. Our proposed 20 tonnes per day flax pulp mill can be started and stopped easily, similar to a simple pilot plant operation. In contrast, the world-scale kraft wood pulp mill produces over 1,000 tonnes per day. It is much more difficult to start up and operate such a large-scale pulp mill.

Novel Innovative Technology

Our technology has been patented only recently. Thus, there can obviously be no comparison to other existing operations anywhere else in the World. Our technology is an original approach to solve the ubiquitous problem of industry development in an urban setting. And more specifically, it is an innovative local attempt to build and operate an effluent-free low-cost pulp mill. No need to import "Swedish" manufacturing technology.

Hazardous Chemicals

Of the 6 chemicals that we have listed on Page 16 of our project prospectus, only potassium hydroxide and hydrogen peroxide might be considered mildly hazardous. These two chemicals are already in common household, industrial and municipal usages. Certainly, approved safety measures would be taken at the proposed flax pulp mill to handle possible spillage of any of the process (non-volatile) chemicals.

I would like to invite you and your Association members to our laboratory in Vancouver to witness the operation of our pilot plant digester. The pulping process of the proposed flax pulp mill is simulated routinely. During the lab demonstration trial,you can assess for yourselves the "odour emission" propensity of our technology. For your information, GVRD engineering staff and separately the Surrey Municipal officials had already witnessed the pulping operation at our laboratory during the past month.

I have been informed that Mr. Parsons of the MPRC will be writing to you separately regarding issues raised in your December 6 letter.

Please do not hesitate to contact me if you have any other queries regarding our proposed flax pulp mill project.

Yours truly,

Al Wong
President

Copy: Mr. D. Parsons/ MPRC
Mr. F. Wiles/ Surrey Municipality

ARBOKEM INC.
SUITE 101, 358 EAST KENT AVENUE
VANCOUVER V5X 4W6, CANADA
TELEPHONE: 1-604-321-9331 FAX: 1-604-321-3043

December 12,1990 AK7170

Mrs. Sandra Cattermole
Secretary
Port Kells Community Association
c/o 8850 Harvie Road
Surrey, B.C. V3T 5J4

Dear Mrs. Cattermole,

Re: Proposed Flax Pulp Mill

This note is to acknowledge the receipt of a copy of your December 8 letter to Mr. David Parsons of the MPRC.

I can appreciate your Association's concern about the construction of a "pulp mill" in the neighbourhood.

I would like to assure you that our proposed flax pulp mill is not an ordinary kraft wood pulp mill. In fact,the technology to be used in the proposed flax pulp mill is so different that it is not possible to issue any meaningful standard "Environmental Impact Statement".

Unlike all other kraft wood pulp mill in North America, there would be no burning of the spent pulping liquor and solid wastes at our proposed flax pulp mill. Only the following quantities of pollutants can be estimated:

Hydrogen sulphide*	Zero	milligram/cubic metre of air
Methyl mercaptan*	Zero	milligram/cubic metre of air
Dimethyl sulphide*	Zero	milligram/cubic metre of air
Dimethyl disulphide*	Zero	milligram/cubic metre of air
Sulphur dioxide	Zero	milligram/cubic metre of air
Particulate matter	Zero	milligram/cubic metre of air
Carbon dioxide	Zero	milligram/cubic metre of air

The chemicals marked (*) are the pollutants which are uniquely associated with the malodourous air pollution problems of kraft wood pulp mills in the Province.

Similarly,as shown on Page 17 of our Project Prospectus, the expected level of water-borne pollutants is so low that a standard "environmental impact statement" has no real meaning.

Because our technology has been patented only recently, there is obviously no comparison to other existing operations anywhere in the World. Our technology is an original approach to solve the ubiquitous problem of industry development in an urban setting.

I would like to invite you and your Association members to our laboratory in Vancouver to witness the operation of our pilot plant digester. The pulping process of the proposed flax pulp mill is simulated routinely. During the lab demonstration trial,you can assess for yourselves the "odour emission" propensity of our technology. For your information, GVRD engineering staff and separately the Surrey Municipal officials had already witnessed the pulping operation at our laboratory during the past month.

I have been informed that Mr. Parsons of the MPRC will be writing to you separately on the issues that you have raised in your December 8 letter.

Please do not hesitate to contact me if you have any other queries regarding our proposed flax pulp mill project.

Yours truly,

Al Wong
President

Copy: Mr. D. Parsons/ MPRC
Mr. F. Wiles/ Surrey Municipality

APPENDIX 6

Newspaper Articles on Arbokem Proposal

Business

THE VANCOUVER SUN

☆☆☆☆☆C Wednesday, November 7, 1990

Proposed Surrey plant would weave pulp from flax brought in from Saskatchewan

By BEN PARFITT
Sun Forestry Reporter

A Vancouver company is proposing to build the first mill in B.C. to use flax straw instead of wood to make pulp.

Arbokem Inc. president Al Wong said the $8-million mill his company plans to build in Surrey would produce 20 tonnes of pulp per day from flax grown in Saskatchewan.

Wong said the mill would be only two per cent of the size of the typical world-scale kraft pulp mill now operating in B.C. and would employ 23 workers.

It wouldn't use the environmentally damaging chlorine bleaching agents that until recently were in widespread use throughout B.C.'s coastal pulp industry, he said.

> "It's a challenge to build a pulp mill in an urban setting without affecting the environment"
>
> — Al Wong

Wong said his company, in conjunction with the Potash Corp. of Saskatchewan, has patented a potassium pulping process. No chlorine or chlorine dioxide will be used to make the pulp, he said.

Wong, who trained as a chemical engineer, said the mill will also be "virtually effluent-free" since mill plans call for all the excess pulping liquor and bleaching effluent to be collected and recycled into a potassium fertilizer.

"It's a challenge to build a pulp mill in an urban setting without affecting the environment," Wong said Tuesday.

"We hope we are going to be able to accomplish this task."

Wong said the pulp will be sold in Taiwan, Japan, Indonesia and Western Europe, and then be manufactured into bank note, Bible and other high-quality papers.

While North America's paper industry is geared almost entirely to making paper from wood-based pulps, other parts of the world with shortages of trees have been working with straw and other raw materials for some time, Wong said.

Domtar did operate one pulp mill in Quebec that produced pulp from flax straw, Wong said. But it closed in 1985 because of pollution problems.

Arbokem is applying to build its mill under B.C.'s new major project review process and will be holding a public meeting to explain its project at the Surrey Inn on Nov. 13.

Proposed Port Kells mill may cater to Europeans

German marks or French francs could soon be printed on paper milled in Port Kells.

A high technology non-polluting flax pulp mill is planned for operation in the Telegraph Trail section of Port Kells, Arbokem Inc. of Vancouver has announced.

The specialty mill will produce 20 tonnes of finished flax pulp per day and employ 23 persons when fully operational in 1991, the company said.

Arbokem will be using a patented potassium pulping process in which the principal bleaching chemicals will be oxygen and hydrogen peroxide, a spokesman said. No chlorine or chlorine dioxide will be used at the production facility.

"The pulp flax mill will be virtually effluent-free as all pulping liquor, bleaching effluent, and fibre rejects will be collected for subsequent processing into value-added potassium fertilizer for the export market," Arbokem Inc. president Al Wong said.

"There will be no burning of or spent pulping or bleaching liquor. Thus, there will be no emission of odiferous sulphur compounds and carbon dioxide."

The raw material for the flax pulp mill will be decorticated flax straw procured from the farmlands of Saskatchewan and Manitoba. No forest resources will be used, he said.

Wong stressed the small size of the project noting that its production capacity would be less than two per cent of the size of a typical world-scale kraft wood pulp mill.

The manufacturing plant will also be used as a advanced research and development facility for new pulping and bleaching technologies.

The flax pulp will be exported to Asian and European papermills for the manufacture of banknotes, Bible and other high quality specialty papers.

Arbokem is applying for approval in principle from the Major Process Review Process Committee (MPRP), a provincial body.

The company has released its MPRP prospectus which describes the project and identifies related environmental and socio-economic impacts.

Arbokem will be holding a public information meeting at the Surrey Inn on November 13 at 7 p.m.

Arbokem expects to receive a decision from the MPRP committee on its project before year end.

Subject to approval by the MPRP committee and by the regulatory agencies, and completion of financing, the new technology mill is planned for start up in late 1991.

Just the flax facts: Residents

By Olivia Scott
Staff Reporter

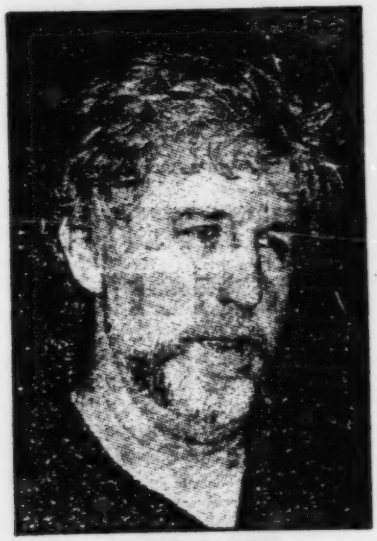
Langley residents want all the facts on flax before they make up their minds on a proposed pulp mill.

Arbokem Inc. wants to build an $8 million flax pulp mill in the nearby Port Kells industrial site in Surrey.

The mill would use flax straw instead of wood to make pulp.

And although company president Alfred Wong swears it will be environmentally safe, nearby residents say "prove it."

"It's easy to say one thing and another to prove it in the long term," said Dave Olson, who lives in the Walnut Grove housing development two kilometres away.



DAVID OLSON
once it's in, that's it

"Once it's in, you're not going to see it taken out, that's for sure."

Wong said the mill will use a potassium pulping process instead of environmentally-harmful chlorine process used by some B.C. pulp mills.

Excess bleaching agents and pulp liquor will be collected and recycled into potassium fertilizer, he said.

The high-grade pulp will be used for bank notes and Bible paper, he said.

Resident Judy Hauser said the project should be given a chance "if it is going to be small and the president guarantees it won't be hazardous.

"On the other hand, I think residents should be given a choice of whether they want it."

Greenpeace campaigner Brian Killeen said the fact that chlorine won't be used puts it "a step ahead" of other pulp mills.

It's also similar to the type of community-based resource technology that Greenpeace encourages, he said.

"Overall, it looks like a fairly good proposal," he said.

Arbokem is applying to build the mill under B.C.'s new major project review process.

There's a public hearing on the project tonight at 7 p.m. at the Surrey Inn.

Flax pulp plant planned for port

by Charles McKaig

Walnut Grove would not be far from a proposed pulp plant in Port Kells.

Alfred Wong, president of Arbokem Inc., wants to put an $8 million flax pulp mill in the Port Kells industrial area.

The mill would produce 20 tonnes of finished flax pulp per day and employ 23 people when fully operational. Wong said that could be as early as 1991.

Wong is the inventor of the "potassium-pulping technology" which is behind the plant.

"It's hot off the shelf," said Wong. According to Wong, his plant won't have the characteristic smell of wood-kraft plants, because it uses potassium in its pulping process instead of sodium.

Wong said the plant will be virtually effluent-free, as all the pulping liquor, bleaching effluent, and fibre rejects will be collected and made into potassium fertilizer.

He added that, because there will be no burning of spent pulp or bleaching liquor, there will be no emission of carbon dioxide into the atmosphere.

Flax pulp is used to make such things as banknotes, Bible paper, and dictionary paper, because of its great strength. The pulp from Wong's plant will be exported entirely to Asian and European papermills.

Smaller than the traditional wood-kraft mills, Wong doesn't think size is important in his company's success.

"You don't have to be big to make money," he said, "You just have to be clever."

Wong said that Port Kells was chosen because of its closeness to the Fraser Docks, where

(Continued on 2a)

More about . . .

Flax pulp

(Continued from front page)

its product would be shipped from. He also said the site was affordable.

"If someone's got a cheaper place, I'm willing to move there," he said.

Jiri Tichy, an employee of the company, said that although the plant could be used for the production of wood pulp, that was not its intention.

He said that, because of its size, the plant wouldn't be able to keep up with other B.C. plants five times it's size, if it tried to produce paper from wood instead of the higher grade flax product.

Mike Thomson, a Walnut Grove resident, said that the plant might be okay if Wong keeps his word.

"Well, I'm willing to give it a chance, if all the safeguards they say are in place," said Thomson, adding, "but I don't want the place smelling like Squamish."

Flax pulp mill planned for Surrey, B.C.

Arbokem Inc. wants to build a 20-metric-tpd flax pulp mill in Surrey, B.C., that will impinge fairly lightly on the environment. Al Wong, president of the Vancouver-based firm, noted the project is less than 2% of the usual size of world-scale kraft woodpulp mills. If approvals and financing run according to expectations, the mill could be operating by late 1991. Asian and European customers will use the pulp to make banknote, bible, and other high-value specialty papers.

The facility will utilize decorticated flax straw—rather than timber—from farmlands in Saskatchewan and Manitoba. The firm's patented potassium pulping process will be used, and bleaching will primarily be done with oxygen and hydrogen peroxide. In addition, the firm noted that the mill will be "virtually effluent-free" because the pulping liquor, bleaching effluent, and fiber rejects will be collected to make potassium fertilizer for the export market. And because the spent pulping and bleaching liquor will not be burned, "there will be no emission of odoriferous sulfur compounds and carbon dioxide to the atmosphere."

© 1990 Miller Freeman Publications Inc.

Mirrored interest

The UK's Mirror Group Newspapers has purchased Maxwell Communication's 27% stake in Quebec-based Donohue Paper mills for £128.7M ($205M). Meanwhile, Donohue is building a $25M chlorine dioxide plant at its Felicien pulp mill, for start-up by the end of 1991.

BASF builds

BASF plans to build a $29M plant in Monaca, Pennsylvania, to produce acrylate-copolymer dispersions, used as binders and coating materials in the paper industry. Start-up is scheduled for late 1991.

Oji subsidiary

Oji Paper plans to establish a Canadian subsidiary in 1991, to market newsprint produced by Howe Sound mill, owned jointly by Oji and Canfor. The subsidiary will grow out of Oji's Vancouver branch.

Fraser pulps

Fraser subsidiary Atholville Pulp in New Brunswick began production of chlorine-free bleached pulp this month, following a $9M oxygen delignification investment at its Atholville mill.

Papers are ready

Copies of the papers presented at the Niagara Lockport's International Papermakers' Tissue Conference held 21-23 August in Toronto, Ontario, are now available.
Details: Laurie Cairns tel 904 627 7141; fax 904 627 7184.

Arbokem flax

Arbokem of Vancouver intends to build a "small scale" 7000tpy flax pulp mill in Surrey, British Columbia. Start-up late 1991.

Repap shares

Hamblin Watsa Investment Counsel has raised its stake in Repap Enterprises to 12.8%, after purchasing 277,200 shares in the Montreal-based company.

Paperweek '91

Paperweek '91 will be held at the Palais des Congrès in Montreal, Quebec, from 29 January to 1 February. It includes the AGM of the technical section, CPPA, and Exfor '91. Details: (514) 866 6621; fax (514) 866 3035.

More competition

Canada's forest products industry will face growing competition from low-cost regional producers in Asian markets, says Garrie Styan, manager of H A Simons (International) pulp and paper services.

South-east Asia's demand for pulp and paper will continue to mushroom, but Canada will have to shift from traditional commodities to more specialised products to hold its market position, he said.

He predicted growing demand for paper and paperboard products such as containerboard, plus virgin and high-quality recycled products.

It is estimated that Asian companies plan to add 300 PMs in the next decade, with the largest number of installations in Japan.

Weak US dollar helps Canada

Canadian market pulp producers are gaining some advantage from the weak US dollar, and transaction prices for northern bleached softwood kraft are reportedly around US$780 a ton for the fourth quarter.

US dollar weakness is supporting US dollar-denominated prices in markets outside North America, points out John Johnson, analyst with Richardson Greenshields Canada. Since the North American posted price dropped to US$800 a ton on 1 July, the US dollar has fallen almost 20% against the yen and almost 8% against the German mark.

The Scandinavians selling in local European currencies have had to bring their prices down in line with "cheaper" North American pulp[illegible] fourth quarter, whil[illegible] denominated prices [illegible] changed.

One special factor i[illegible] market has been custome[illegible] in inventories and a sw[illegible] quality pulps. Canad[illegible] 54% of total Japan[illegible] pulp imports in t[illegible]

for example, down from 61% a year earlier. The US share role to 38% from 33%.

US southern pulp is selling at around US$620 and northern softwood pulp producers may have to drop their premium. Many analysts still expect northern prices to dip below US$700 next year.

Degradable diapers?

Toronto-based consumer products giant Proctor and Gamble (P&G) will spend $20M [illegible]op a fully [illegible]iaper that [illegible]ding before [illegible] spent on [illegible]sting in [illegible]grant to [illegible]o help [illegible]waste

D[illegible]

Fi[illegible]
busin[illegible]
Massachuse[illegible]
Germany.

Rolland hopes to end[illegible] C$13.5M (US$11.6M) non-[illegible] profit from the deal, to be booked in the fourth quarter. PWA is owned by Waldhof-Aschaffenburg, Munich.

Rolland's loss was C$9.3M for the first nine months of 1990, against a loss of $2.1M a year earlier. The latest period included a $5.7M special charge to cover shutdown of the Mont Rolland fine paper mill near Montreal.

Revenues were $311M, down 8% from a year earlier. The company hopes to begin a turnaround next year. It will soon begin studying the future of the Mont Rolland machines.

[illegible]
p[illegible]onalds as a [illegible].

It [illegible]ew multi-layer paper wrap which has a mid-ply of polythene, combined with two paper layers.

James River claims the wrap has heat retention and greaseproof characteristics, and can be made biodegradable.

McDonald's conversion is the result of an agreement with the Environmental Defence. The foam containers, which have been used by the company since 1975, were attacked by environmental groups in the 1980s as difficult to recycle.

A company spokesman has [illegible]eportedly said the foam containers [illegible]'ll be phased out at its overseas [illegible]nchise, but a timetable has not [illegible]n set.

[illegible] orders

Finland's Tampella has won a P[illegible] order from Inland Container's ne[illegible] recycled containerboard mill [illegible] Maysville, Kentucky.

The machine will have a 306in wir[illegible] width, a trim of 280in. and a speed o[illegible] up to 2500fpm. Initial production wi[illegible] be 600tpd, eventually rising to 775tpd[illegible]

The value of the order was no[illegible] disclosed, although PMs of this size[illegible] usually cost around FM200M[illegible] ($51.2M).

Tampella will also rebuild the 280in[illegible] wide fourdrinier machine at Inland[illegible] Container's Ontario recycled liner[illegible] mill. A top wire unit, press, drier and[illegible] calender modifications will be[illegible] supplied.

Back into engineering

The SNC Group, one of Canada's top[illegible] engineering and construction groups, is getting back into engineering-procurement and construction management services for the pulp and paper industry in North America and other countries.

It has set up a joint company SNC-Rust Canada with Rust International of the US. Based in Montreal, it owns 51% and Rust 49%, and it starts operations immediately.

For many years SNC was joint owner of Sandwell Swan Wooster, in partnership with Electrowatt of Switzerland. It sold this interest in 1989 as part of a major restructuring of its business.

[illegible]time it said it planned to get [illegible]o building pulp and paper [illegible]ater when the opportunity

Beloit honour

Beloit has completed an 'Innovative Hall of Honour' at its HQ in Beloit, Wisconsin.

The Hall houses engraved metallic reproductions of current US patents granted to Beloit's employees for their technical inventions, many of which have revolutionised pulp and paper-making.

The names of 434 holders of more than 1,000 expired Beloit patents are also displayed.

BRITISH COLUMBIA REPORT, NOVEMBER 26, 1990

The new flax of life

An inventor hopes to profit from a non-polluting pulp process

Alfred Wong is a man with ideas. Fresh from of the University of British Columbia with a degree in chemical engineering, he went to work for Crown Zellerbach (now Fletcher Challenge Canada Ltd.) in Campbell River. Then he won a scholarship to McGill University, completed his master's degree and became head of the water research section at the Pulp and Paper Research Institute of Canada in Montreal.

He could have settled down in a comfortable career researching whatever the government or industry wanted him to. But he had other ideas. He struck out on his own and started his own chemical research company, Arbokem Inc. Now, after six years of development, he is ready to launch his best idea yet. Mr. Wong wants to build a mill in Surrey to make specialty pulp. Unlike other mills in Canada, his mill will use flax rather than wood as a raw material.

Flax is grown in the Prairies primarily for its linseed oil. The remainder of the plant is generally burned in the field or for fuel. However, flax fibres are stronger and more durable than wood pulp and therefore ideal for thin dictionary and Bible pages, cigarette papers or heavy-duty banknotes and documents. Flax pulp has been around for decades, but the traditional manufacturing method is an environmentalist's nightmare. Canada's last flax pulp operation, run by Domtar Inc. in Quebec, shut down seven years ago rather than clean up its act. By contrast, Mr. Wong's process is nearly emission-free. And more important, the technology he uses may be applicable to other fibres as well.

Alkaline sulphites are needed to make flax fibre into pulp. In a traditional kraft pulp mill, those sulphites are sodium-based and harmful to the environment. But Arbokem's patented method uses potassium sulphite, the byproducts of which can be made into fertilizer. Better still, the pulp can be bleached with hydrogen peroxide instead of the usual chlorine dioxide, meaning there would be no dioxins or furans emitted, just more fertilizer. "Everything's going to be used," Mr. Wong promises.

But for all of his enthusiasm, forest companies are still not jumping at Mr. Wong's idea. For six years Arbokem has been financing most of its own research, although 10% of its funds came from a National Research Council grant. Arbokem has also established a working relationship with the now-privatized Potash Corporation of Saskatchewan that will provide potassium products and fertilizers. All that's left for Mr. Wong is to raise $8 million for his factory and pass a public environmental review process. The plant could be up and running in a year.

Engineer Wong: *He still must convince the forest companies.*

Mr. Wong insists his venture is a modest one, at least to start. The market for flax pulp, mostly in Europe and the Orient, is limited. The Surrey plant would produce just 20 tonnes of pulp a day, employ 23 people and sell about $14 million of pulp and $850,000 of fertilizer a year. More significant returns, however, would come through the sale of related technology.

"I would call it a demonstration plant," says Dr. Leslie Galloway, manager of environmental technology for forest industry consultants H.A. Simons Ltd. The modest scale of the operation has played a big part in the pulp and paper industry's lack of interest. Obviously forest giants would be interested only if Mr. Wong's project proves successful. The $8-million question is: Can the mill turn a profit?

—Michael McCullough

'Odorless' mill planned for Port Kells

by Bruce Cox

Anybody who's either grown up in or driven through a pulp and paper town is well-acquainted with the aroma of sulphide gases.

Many of the same people have probably wished, consciously or subconsciously, that someone would invent a pulping process that doesn't produce a stink.

Al Wong, president of a Vancouver-based company that specializes in pulp and paper research and development, says he's done exactly that.

If Wong receives provincial government approval, he intends to make Port Kells Industrial Park the site of the world's first potassium pulping mill.

Wong patented the process last year and claims it is an odor-free, environmentally friendly method of pulping flax fibre.

Wong says that, unlike the standard process used in wood pulp mills, his new technology requires no burning of liquid or solid wastes, no chlorine or chlorine dioxide bleaching, and creates only a limited flow of waste into the sewer system.

Wong says the unique process, combined with the small size of the operation, make for a limited environmental effect.

The $8 million plant would employ 23 and produce 20 tonnes of flax pulp a day, using flax straw from Manitoba and Saskatchewan.

"If you look at this (20 tonnes) in terms of the Howe Sound pulp mill, it would run for 20 minutes a day," said Wong.

Wong said he doesn't see any need to ever expand the operation, as flax

(Continued on 2a)

More about . . .

'Oderless'

(Continued from front page)

pulp is a specialty product with a limited demand.

"When you're making specialty things, you don't want to make too much or the market will collapse," said Wong. He later added that if the demand for his product increases substantially, he will build a second mill rather than expand.

The flax fibre, while narrower than that of Jack Pine or Black Spruce, is much longer. The average seed flax fibre is 25 mm long, while the typical pine or spruce fibre is only 3.5 mm in length.

Wongs says flax pulp can be used to make paper that is thin yet durable. Paper currency as well as bible and dictionary paper are among flax pulp's uses.

He also suggested that it might provide a preferable alternative to the present formula for recycling newsprint.

The current process involves 50% de-inked newspaer and 50% wood pulp. Wong's proposed method would use 95% de-inked newspaper and 5% flax pulp. Wong reasoned that, for the same cost, more paper would be recycled and more trees would be saved.

Wong explained that all existing pulp mills (flax or wood) use sodium sulphite, sodium hydroxide, or sodium sulphide and sodium hydroxide. All of these chemicals, he said, create by-products that are costly to dispose of.

The Arbokem method is designed to use the by-products to co-produce potassium fertilizer.

The bleaching process would be achieved by means of oxygen and hydrogen peroxides as opposed to chlorine or chlorine dioxide.

Wong says the amount of treated waste actually entering the GVRD sewer system would be about four cubic metres per day, would not contain any dioxins or furans, and would not be toxic to fish.

With government approval, Wong will begin to seek financing for the project next month. If all goes as planned, he hopes to have the mill built and ready for operation by this time next year.

Ann Hillyer, staff counsel with the West Coast Environmental Law Association, said it's "promising" to see somebody proposing this type of pulp mill, but that it is still too early to pass judgment on the new concept.

"My only concern is that there should be a more complete environmental impact statement provided, rather than the prospectus that I've seen," she said.

Hillyer said she hopes the steering committee of the provincial government's major project review process, will thoroughly examine the mill's environmental impact.

Pollution battle provides him with profits

ENVIRONMENTAL challenges facing business in the coming decade was the hot topic for a recent seminar series organized by the Business Council of British Columbia.

Public relations ace James Hoggan talked about the bell curve of public opinion. He stressed the importance of knowing an issue's precise location on that curve when preparing strategic plans for intelligent crisis management.

"Where on the bell curve is the environmental movement today?" asked one grey-flannelled participant in a later session.

"Right at the leading edge," came the unanimous answer from seminar leaders. "You ain't seen nothin' yet."

Many business executives in the Simon Fraser lecture theatre visibly winced. To them the answer seemed a harbinger: More grief. More trouble. More worry and stress.

But a few grinned broadly.

Some business leaders still see public concern about the environment as fallout from a sinister conspiracy intent upon dismantling the economy. The perceptive few see a cornucopia of opportunities for shrewd, quick-thinking entrepreneurs.

Al Wong is one of the latter.

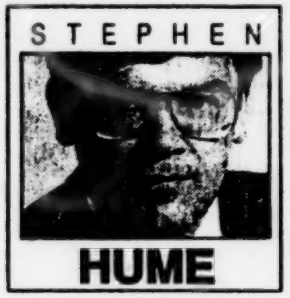
He's a square, stocky man. In an age of *Gentleman's Quarterly* clones and tinted contact lenses, he wears round, wire-rimmed spectacles and a bristly black moustache.

His speech crackles with sardonic one-liners and wry asides that most of us who grew up speaking English can only envy. Yet he arrived not knowing a word of the language.

Al Wong, at 47, in several ways represents the future.

One year after B.C.'s exports to the Pacific Rim first exceeded those to the United States, he's an example of the trans-Pacific family. His great-grandfather came to San Francisco in 1860 to work on the transcontinental railways. His grandfather came to Canada in 1900.

His father graduated from the University of Toronto, then returned to China to operate a pulp mill for a Swedish firm. Al was born in Szechuan, in a China occupied by Japan and awaiting Mao Tse-tung's revolution.



Al came to Canada in 1956 and attended Beaconsfield, Strathcona and Vancouver Tech.

Environment was a term used more by office furnishers than activists when he graduated from UBC with a degree in chemical engineering, then followed the pack into B.C.'s biggest industry.

He joined Crown Zellerbach as an engineer at its kraft pulp mill near Campbell River. When public concern about the environment first peeped over the horizon, Al was pleased to become the plant's pollution control engineer.

But his interests were already drifting away from operations and toward research — in particular, inventing new technologies to exploit the opportunities he was sure would emerge along with growing concern about pollution.

Al returned to graduate studies at McGill, then went to work as water resources specialist in an industry-funded research lab in Montreal. After 13 years he founded Arbokem Inc.

"We started out in 1983 in a basement," he says, "but my ambition was not to live in a basement for the rest of my life. A year later we had a research lab operating in Montreal."

Arbokem symbolizes another aspect of a rapidly arriving future — smart people finding ways to profit from environmentally clean technologies.

In 1989, in partnership with Saskatchewan's giant potash corporation, Arbokem patented a potassium-based bleaching process which eliminates both gas emissions and production of harmful organochlorines from effluent. The pulp liquor is treated to reclaim bleaching compounds for sale as agricultural fertilizer.

Arbokem is raising capital for a small, environmentally friendly mill in Surrey. It will produce pulp from flax straw — waste that prairie farmers otherwise burn in the fields after harvesting for linseed oil. As fibre, it's worth $350 a tonne.

Al says he'll produce only about 20 tonnes of pulp per day, but it will be high-quality product aimed at a niche market — specialty paper producers in Europe and Asia prepared to pay $2,000 a tonne for printing banknotes and Bibles.

Environmentalists' demands for recycled newsprint is another rising specialty market that makes Al grin. To produce usable paper, recycled wood pulp must be 40 per cent virgin fibre. But the strength of flax fibre means the mix could be 95 per cent old newsprint and only five per cent virgin fibre.

Some people wince when change arrives. Others hit the ground running. As for me, if Al Wong can deliver what he promises, I hope he makes a million — he'll have earned every cent. ☐

Stephen Hume writes Monday, Wednesday and Friday.

Business
THE VANCOUVER SUN
☆☆☆☆ Monday, December 10, 1990

Flax-pulp plan gaining speed as big schemes grind to halt

Like Rapunzel, engineer would weave straw into golden profits from pulp plant

By BEN PARFITT
Sun Forestry Reporter

IN THE LATE 1980s when the Alberta government hatched plans to sell off the province's vast boreal forests to multinational pulp interests, Al Wong had a novel idea.

Why not build smaller mills using less environmentally hazardous bleaching processes or, better yet, build pulp mills that make pulp from straw rather from than wood?

The chemical engineering graduate from the University of B.C. carried the idea to a then-deputy minister under LeRoy Fjordbotten, Alberta's forestry minister at the time.

But nobody showed much interest, Wong recalls.

"The Alberta government at that time was interested in big things — big pulp mills," Wong said. "The political bosses — Fjordbotten and up — wanted something dramatic."

Wong concluded his posting with Alberta's forest industry development branch in 1988, just before a wave of controversy descended on an unprepared Fjordbotten and his colleagues.

A year later, an unprecedented environmental review of a pulp mill proposed for the banks of the Athabasca River near a tiny hamlet called Prosperity concluded, and the megaproject was shelved indefinitely.

Wong's dream of smaller, more environmentally friendly mills hasn't died, however.

Not a new concept

Today, in an industrial park in south Vancouver, the 47-year-old has plans to build the first pulp mill in B.C. to use flax straw instead of wood chips to make high quality and expensive pulp.

Making pulp from straw is not a new concept, Wong said. Throughout the world many smaller mills make pulp from agricultural residues because of a shortage of trees. But the idea has been slow to catch on in North America.

It also has had a tough time gaining a foothold because, like all pulp projects these days, environmental performance has become a key issue.

Wong said his company, Arbokem Inc., and the Potash Corp. of Saskatchewan has that problem licked. Together they hold patents to a new potassium-based pulping process that will mean no smelly air emissions and no discharges of harmful organochlorines like dioxins that have resulted in shellfish closures along B.C.'s coast.

Wong wants to build a small $8 million 7,000-tonne-a-year flax straw pulp mill in Surrey that will use the new bleaching process and employ 23 people.

Wong's mill will produce in one year what a giant kraft mill in B.C. makes in less than a week. But it will get much more money for its pulp. Wong said he'll get about $2,000 for each tonne of pulp produced, while most kraft mills in B.C. today get around $750 US.

'Don't have to be big'

He plans to sell the pulp to Asian and European buyers who will then convert it into fine papers for use in bibles and currency.

"I think there is a wave in the future for smaller mills. You don't have to be big to make money. You've just got to be clever," Wong said.

Arbokem has already held two public meetings under the provincial government's new major project review process. The outcome has been very supportive, he said. In fact, he's getting calls from farmers interested in selling him their waste straw.

Wong proposes to get the straw he needs from prairie farmers.

About 500,000 hectares of flax is planted annually in Saskatchewan and Manitoba. The straw itself is generally considered of little value, the waste left on the field after the linseed for which the flax is grown has been extracted.

Historically, only three companies have purchased the straw — one in North Carolina, one in New Jersey and Domtar in Montreal, Wong said.

"In '83 Domtar was still operating a flax mill outside of Montreal using a kraft process," Wong said. "The black (pulping) liquor went straight into the St. Lawrence. The government said you've got to stop this kind of thing . . . so they (Domtar) said, 'let's get out of the business.'"

Domtar's exit means Surrey could be the only place in Canada with an active flax pulp mill.

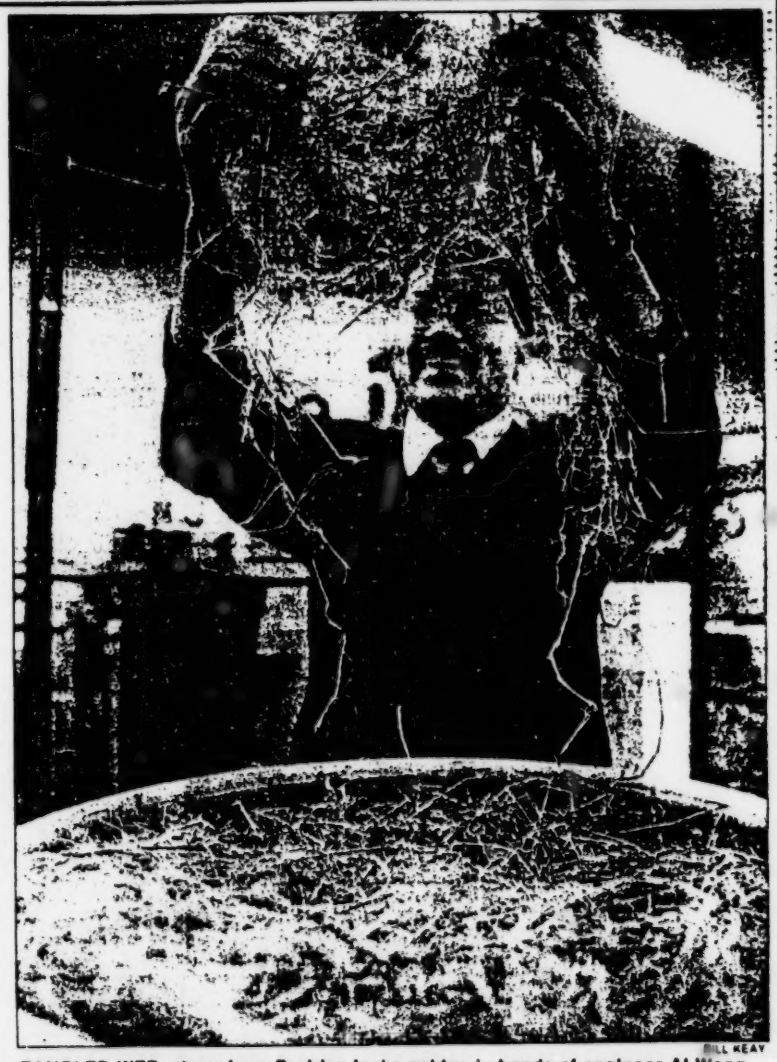
An important sideline of the Surrey project is the pulp byproduct. Wong said he plans to recover almost all mill's waste solids for fertilizer in Taiwan and Japan.

He conservatively estimates that the Surrey mill could have $1 million in annual fertilizer sales and $14 million in pulp sales.

Wong is also eyeing the growing recycled newsprint market. Most recycled newsprint, Wong said, is made from a combination of deinked and re-pulped newspapers and virgin pulp fibre.

The beauty of flax-based pulp, he said, is its strength. Where many deinked papers are now made by combining 50 per cent virgin softwood pulp with deinked pulp to make a finished sheet, only five per cent flax pulp would be needed to replace the wood-based pulp.

The days of relying on softwood kraft pulp to meet an ever increasing demand for paper are over, Wong said, because " . . . when you only have a limited resource of softwood you better start looking at other things."



BILL KEAY

TANGLED WEB: straw from Prairies looks golden in hands of engineer Al Wong

Leader-Post file photo

Flax straw is often burned right in the field

Leader-Post — 90-12-17

Flax may play big part in recycling programs

By D'ARCE McMILLAN
of The Leader-Post

Someday, this newspaper might be made from 95 per cent recycled newsprint and five per cent flax straw, thanks to Saskatchewan-developed technology.

Alfred Wong, a chemical engineer living in Vancouver who calls himself "a pulp-and-paper guy," is promoting technology developed in conjunction with the Potash Corp. of Saskatchewan (PCS) as a way to make small pulp plants economically viable by using a variety of straw types as feed stock.

Small plants using existing technology are expensive because a large part of the capital cost of a facility normally is dedicated to cleaning up the mess it makes, he said. The small plants can't make enough money to justify the high capital cost.

The new, cleaner technology that uses potassium sulphite instead of traditional sodium sulphite reduces the cost of a plant by as much as a half, he said.

The sodium process is smelly and produces harmful byproducts. The byproduct of the new process is sulphate of potassium, a liquid fertilizer that can be sold, and harmless hydrogen peroxide.

Garth Moore, PCS vice-president of technical services, said although the process was created jointly by the corporation and Wong's company Arbokem, the exclusive rights are now owned by the Vancouver researcher.

"Our only involvement now would be the potential of increased sales of potash," he said.

Wong is promoting the idea of a small, $8-million, 23-employee pilot plant in the Vancouver suburb of Surrey, using flax straw as a feed stock. It is expected it would produce about $14-million dollars of pulp and $860,000 of fertilizer a year.

Flax straw has very strong fibre and for centuries has been used to make pulp for paper for currency, dictionaries, bibles and cigarettes.

But Wong said his technology could be used on the Prairies, and has even had discussions with a group of Manitoba farmers about the feasibility of establishing a portable plant in that province.

He has also written to Saskatchewan Economic Diversification Minister Grant Schmidt to inform him of the technology. Wong noted Saskatchewan is looking into a plant in Denmark that makes pulp from wheat straw.

Wong was recently at that plant to get information to make a proposal to sell it his technology.

Because flax straw is so fibrous and hard to break down, it is hard to work fields covered in it after harvest so farmers often burn it. Some efforts have been made to gather and bale the straw for shipment to paper plants in the United States, but shipping costs make the venture risky.

The flax pulp could also be used to make recycling newsprint a more viable operation, he said.

"The best technology now available allows the use of only 50 per cent recycled, de-inked paper coupled with 50 per cent virgin material because recycled paper fibre isn't as strong," he said.

"With the use of very strong flax fibre, you might be able to boost the recycled component to 95 per cent."

REGINA LEADER-POST DECEMBER 17, 1990

Ben Parfitt Forestry

Van Sun Sat Dec 28/90

"Doing more with less" is rapidly becoming the measuring stick by which all forest companies will be judged in the 1990s.

PARFITT

And why not? If companies did more with their timber, the record rate of tree cutting in B.C.'s forests might be reduced.

With "value-added" in mind, let's take a look at this year's winners.

● He may look like a spoiled rich kid with a penchant for expensive eyeglasses and two-piece green suits but Stuart Belkin did what nobody else in B.C.'s forest industry had the gumption to do: create something useful out of the mountains of used newspapers now making their way into landfills each year.

With a $14 million provincial loan in hand, Belkin unveiled plans in July to build B.C.'s first de-inking facility, an $80 million mill in Coquitlam. Fletcher Challenge Canada Ltd. and MacMillan Bloedel Ltd., will buy Belkin's recycled pulp, beginning in late 1991. They must do that if they hope to meet tough new environmental guidelines in California's newsprint market.

● Hats off too to MB for spending $100 million on a new fine-paper coating machine at Island Paper Mills. MB continues to add value to paper and protect 381 jobs at B.C.'s only fine-paper mill.

If only other companies did the same. Instead of making fine papers, forest companies in B.C. are expanding into far less labor-intensive pulp production. MB deserves credit for taking a tougher — but ultimately more rewarding — road.

● A salute to Al Wong, the chemical engineer proposing to build the first mill in B.C. to be use flax straw instead of wood to make pulp. It seems Wong can build a mill that won't use any chlorine, produces no dioxins, and command $2,000 for every tonne of pulp produced.

Please see FORESTRY, E4

FORESTRY

Continued from page E3

Look for Wong to build an $8 million mill in Surrey, employing 23 people and producing 7,000 tonnes of specialty pulp each year. "You don't have to be big to make money. You've just got to be clever," says Wong.

Indeed.

● Finally, a nod to Cariboo Fibreboard Ltd. president Volker Stockmann. Stockmann is building a $140 million fibreboard plant in Williams Lake that will run entirely on waste chips and sawdust produced in area mills, waste that currently goes up in smoke.

The thorn in the project: Stockmann won a 25-year contract to harvest small trees in the region's already over-cut forests if the mills can't supply him. Stockmann says he needed the wood in order to secure the loans to build the plant. Critics argue the guarantee reduces B.C.'s forests to collateral for companies seeking bank loans, and raises the possibility of higher future cuts.

APPENDIX 7

MPSC Correspondence with Arbokem

B.C. ENVIRONMENT
ENVIRONMENTAL ASSESSMENT BRANCH

Province of
British Columbia

Parliament Buildings
Victoria, B.C.
V8V 1X5

File: 65.425

February 13, 1991

BRITISH COL... ...
ENVIRONME...
FEB 19 1991
ENVIRONMENTAL ... CT
ASSESSMENT B...
VICTORIA, B

Mr. Al Wong
President
Arbokem Inc.
Suite 101
358 East Kent Avenue
Vancouver, British Columbia
V5X 4W6

Dear Mr. Wong:

The Major Project Steering Committee (MPSC) has reviewed the Prospectus submitted by Arbokem Inc on October 25, 1990 under the Major Project Review Process (MPRP) to locate a flax pulp mill in Surrey. The MPSC has determined that the plant design, operating procedures and contingency plans proposed for this project will provide a satisfactory level of environmental protection.

Therefore, we are pleased to inform you that the MPSC has granted approval in principle to Arbokem's proposal under the Major Project Review Process (MPRP), subject to your agreement to the following nine conditions.

1. Monitoring Committee

A Monitoring Committee, chaired by the GVRD, will be established to oversee the development of a program to monitor potential impacts associated with plant operations. The Monitoring Committee will include representatives from B.C. Environment, Environment Canada, the District of Surrey and Arbokem Inc. Detailed terms of reference are to be prepared by the Committee, and implemented by Arbokem Inc. The Committee will:

- develop a monitoring program that provides for the sampling and testing of air emissions, liquid effluent to be discharged to the municipal sewer system, and waste

by-products. Air, water and waste streams will be monitored by Arbokem, and the Committee will be responsible for establishing testing protocol and for evaluating test results of the monitoring process;

- review and advise regulatory agencies about changes in process technology and the use and disposal of waste by-products; and
- report to the MPSC every six months.

The activities of, and need for, the Monitoring Committee will be reviewed by the MPSC two years after plant start-up.

Arbokem Inc. will be responsible for funding the monitoring program.

2. Air Quality

Arbokem will ensure that all air emissions from the facility meet the requirements of the GVRD. In addition, Arbokem must meet B.C. Environment's requirements for a waste management permit for air emissions from the scrubbers, natural gas-fired boiler and water vapor from the pulp dryer. The permit will be administered by the GVRD.

3. Effluent Treatment and Discharge

The discharged effluent will be required to meet municipal sanitary sewer use requirements. All evaporator condensates and excess white water must be treated in a secondary treatment system (activated sludge) prior to release into the municipal sanitary sewer system. In addition, the activated sludge and effluent discharge system must be designed to handle the maximum expected flow, including all excess white water as well as evaporator condensates. Used cooling water directed to the municipal storm sewer must be free of contaminants.

4. Utilization and Disposal of Spent Pulping Liquor

The project is based largely on the uniqueness of the patented potassium-sulphite pulping process. Spent pulping liquor and solid waste are to be sold as concentrated liquid fertilizer rather than incinerated or discharged to landfill or sanitary sewers. Alternatively, waste products may be sold as BC Road Stabilizer.

Arbokem has indicated that sodium-sulphite would be suitable for use in the pulp mill in the event of an interruption in the supply of potassium-sulphite. Wastes from the sodium-based process are not suitable for sale as liquid fertilizer.

However, sodium-based effluent can be used as the lignosulphonate component of the BC Road Stabilizer.

Prior to any change in operating procedures to utilize sodium sulphite, Arbokem will be required to prepare a report for the Monitoring Committee describing alternatives for the use and/or disposal of the sodium-based process wastes. The Monitoring Committee must be assured that all regulatory requirements will be met and that there is a confirmed market for the sodium-based waste by-products, prior to commencement of production.

In the event there is no satisfactory market for the spent pulping liquor, Arbokem must confirm its commitment to cease flax pulp production.

5. Spill Contingency and Emergency Response Plan

Prior to startup, Arbokem must provide the Monitoring Committee with an Emergency Response Plan for potential spills of hazardous materials and for safeguards and procedures to be used during plant startup and upset conditions. A satisfactory program for training and testing of emergency response staff must be designed and implemented. In addition, Arbokem must prepare a Spill Contingency Plan for the storage, handling and processing of process chemicals and associated waste by-products. The plan must provide assurance of adequate containment of spills to prevent discharge to the municipal sanitary sewer system or the Fraser River.

6. Transportation

Arbokem must meet all requirements under the federal Transport of Dangerous Goods Act and any additional transportation requirements the District of Surrey may have.

7. Fire Suppression Considerations

The proponent must meet with the District of Surrey Fire Department to review fire suppression considerations and to ensure compliance with the B.C. Fire Code regarding storage, handling and safety procedures at the facility.

8. Industrial Building Conditions

The proponent must meet the standard industrial building conditions for siltation control and the installation of oil/grease interceptors in the storm water drainage system.

9. Archaeological Site Inspection

Arbokem is required to provide the Archaeology Branch of the Ministry of Municipal Affairs, Recreation and Culture with the results of an archaeological site inspection prior to construction activity, to confirm that there are no significant impacts on archaeological resources.

These nine conditions are in addition to any commitments made by Arbokem in the Prospectus document, and outlined in Section 2.5 of the MPSC Report. It should be noted that the MPSC's conditional approval in principle applies only to the project as described in Arbokem's Prospectus filed with the MPSC on October 25, 1990. Approval in principle of Arbokem's proposed project will be valid for five years. If the plant has not been developed within that time, or if significant modifications to the approved plant are considered, the project may have to re-enter the MPRP.

The MPSC requires written assurance that these conditions will be met, before approval in principle can be formally granted. We request that you indicate your acceptance of the above nine conditions in writing to the undersigned. If you have any questions you may contact either one of us, or Mr. David Parsons, MPRP Coordinator, Ministry of Environment, at 387-9677.

Sincerely,

Doug Dryden
Co-Chairman
Major Project
Steering Committee

Frank Blasetti
Co-Chairman
Major Project
Steering Committee

cc: Mr. R. Dalon, Deputy Minister, B.C. Environment
Mr. B. Plecas, Deputy Minister, Regional and Economic Development
Members, Major Project Steering Committee
Mr. Franklin Wiles, District of Surrey
Ms. Christina Jacobs, GVRD

ARBOKEM INC.
Suite 101, 358 East Kent Avenue, Vancouver V5X 4W6 CANADA
Tel.: (604) 321-9331 Fax: (604) 321-3043

BRITISH COLUMBIA
ENVIRONMENT
FEB 20 1991
ENVIRONMENTAL IMPACT
ASSESSMENT BRANCH
VICTORIA, B.C.

004705

February 14, 1991 AK7389

Mr. Doug Dryden
Co-Chairman
Major Project
Steering Committee
Ministry of Environment
3rd Floor, 777 Broughton St.
Victoria V8W 1X5

Mr. Frank Blasetti
Co-Chairman
Major Project
Steering Committee
Ministry of Regional
Development
4th Floor,712 Yates St.
Victoria V8V 1X5

Dear Sirs:

Re: Surrey Flax Pulp Mill Project

We hereby accept your Committee's conditions for the "MPRP Approval-in-Principle" of our Flax Pulp Mill project, as described in your letter dated February 13, 1991.

We confirm that our principal goal is to construct and operate a chemical pulp mill in an urban setting without any adverse effects on the human and natural environment. Our patented technology is based on this principle. The future marketing of our innovative technology to others depends on the successful demonstration of this concept. We are prepared to cease flax pulp production forthwith, if we do not have any satisfactory means to dispose of the fertilizer and road stabilizer co-products which are to be manufactured at our flax pulp mill in Surrey.

Yours truly,

Alfred Wong, P.Eng.
President

B.C. ENVIRONMENT
ENVIRONMENTAL ASSESSMENT BRANCH

Province of
British Columbia

Parliament Buildings
Victoria, B.C.
V8V 1X5

File: 65.425

February 20, 1991

Mr. Al Wong
President
Arbokem Inc.
Suite 101
358 East Kent Avenue
Vancouver, British Columbia
V5X 4W6

Dear Mr. Wong:

The Major Project Steering Committee (MPSC) is pleased to grant approval in principle to the proposal by Arbokem Inc. to develop a flax pulp mill in Surrey, British Columbia. This approval is subject to the nine conditions committed to in your letter of February 14, 1991.

The spirit of cooperation you have displayed throughout our review has been appreciated. Your progress on this innovative mill will be followed with great interest by many different groups. We wish you well with this venture.

Sincerely,

Doug Dryden
Co-Chairman
Major Project
Steering Committee

Sincerely,

Frank Blasetti
Co-Chairman
Major Project
Steering Committee

cc: Mr. R. Dalon, Deputy Minister, B.C. Environment
Mr. B. Plecas, Deputy Minister, Regional and Economic Development
Members, Major Project Steering Committee
Mr. Franklin Wiles, District of Surrey
Ms. Christina Jacobs, GVRD